LIBRARY OF CONGRESS
NOV 22 1898
400045
SMITHSONIAN DEPOSIT.

THE AMERICAN GAS LIGHT JOURNAL

REDMANKENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXIX.—No. 21. Whole No. 1,224. | NEW YORK, MONDAY, NOVEMBER 21, 1898 | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS

An Asterisk (*) denotes an illustrated article.

EDITORIALS—
- Briefly Told 745
  The Trenton (N. J.) War of Rates—Additional Subscriptions to the Educational Fund—Notes.
- The Darkest Capital in Europe 746
- Twenty-sixth Annual Meeting, American Gas Light Association—Abstract of Proceedings—Continued from page 718 746
  Second Day, Afternoon Session—A Gas Engine in a Blowing Plant, by Mr. H. L. Rice—An Experiment with the Shadbolt Self-Enrichment Process, by Mr. Irvin Butterworth—Can We Make All Our Business Pay? by Mr. A. E. Forstall—Some Routine Business—Roll Call.
- Water Tube Boilers in Blast Furnace Practice 749
- *Tar Burners for Marine Boilers 750
- The Determination of Sulphur in Asphalt, by Mr. E. H. Hodgson. 750
- *Kidd's Carbureting Lamp 752
- Playing with Acetylene 753
- Mending Defective Iron Castings, by Mr. T. F. Kennedy 754

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 754
A Correction by Mr. Walton Forstall—The Darby (Pa.) Gas Company Changes Hands—The Acetylene Machine Was Taken Out—Explosion in the Richmond (Ky.) Works—Gas Inspection Ordinance, Houston, Texas—Reorganization of the Norwalk (Conn.) Company—Consolidation at Pekin, Ills.—Latest Gas Schedule, Salt Lake City—Death of Mr. William Jones—Something from Stockton, Cal.—Some Dividends, San Francisco, Cal.—25-Cent Gas at Trenton, N. J.—A Budget from "Observer"—And Other Items.

- Anthracite Coal in Peru 756
- The Market for Gas Securities 756

BRIEFLY TOLD.

THE TRENTON (N. J.) WAR OF RATES.—Trenton, in New Jersey, "on the Delaware," which city has the honor of being the capital of the queerest State in the Union, was noted years ago as about the place where General Washington, his aides and troops, made a perilous crossings, over pontoons of ice and snow, with subsequent great results to the development and progress of America. The contest at Trenton then was for the freedom of a people from the weight of yokedom; but the Trenton of to-day is a battlefield of another sort. We are told that peace hath victories no less renowned than those of war, in which telling we have to submit to surveying a war of foolishness on gas commercial account in Trenton, that outranks even the celebrated gas war of recent date in Kansas City, Mo. To which of the Companies the eagle of peace shall flop is not within our prevision; nor is it worth our thought, save that we attempt honestly to serve the gas industry as a whole from the mildew that would be put upon it by the atmospheric acts of those who blow hot to-day and shiver cold to morrow. The cold and hot facts in the Trenton case are: The orginal Trenton Company, under the domination of its "pristine" owners, their "successors and assigns," forgot the trust that it had to administer in supplying the public with artificial gas light, with the result that in time its prices were considered high and its service was regarded low. The eyes of those on the lookout for a good thing lighted over Trenton, and the struggle for a part or all of Trenton's gas business was on. So far the fording of the Delaware was all *right*—the men who were on the lookout for the good thing came from the west side of the tortuous river—but the "forders," disdaining to purchase, declared for fighting. To pass over the measly coquetries of the Pennsylvania advance guard, in its protocollings with the Trenton authorities, the latter finally gave birth to the "Peoples Gas Improvement Company," although it is matter of history that the nose of Trenton's Mayor, before, during or after the preliminaries, suffered somewhat. In due time the old Trenton Company awoke, discharged one, two or three of its trusted officers, and prepared to rebuild its works, extend its mains and hire an office. Meanwhile the Peoples Gas Improvement Company was at work, putting up much that was new. Before either was ready on new account to supply gas, the selling rates, on "future delivery," were put at $1 per 1,000; later on, but before either was ready for work, the price was "nominally" 50 cents; when the Improvement concern "opened" its plant, the schedule put forth named 25 cents as the price! And such is the standing at present in the Trenton situation. Could anything be more assish, at least so far as the verdict of those who are legitimately in the gas business is concerned? If the Trenton gas field was such a gold mine, why did not the Pennsylvania explorers thereof pay a suitable price for it, and then extend it so that it would return to them not less than one profit beyond their investment? No; they seemingly preferred to win by conquest that which they could not borrow, even if that struggle in the end caused to others not concerned, save by the acts of their fool neighbors, trouble and loss. What we have tried to parabole above is that the gas warfare in Trenton is inexcusable, in that its effect at large on Eastern gas industry is bound to be costly to the owners (through legislative action of one sort or another) of gas investments; for it is not possible that gas of any fair modern quality

may be made in the capital city of Trenton and be distributed under satisfactory conditions, with a profit to its sellers, at a figure under $1 per 1,000 cubic feet.

ADDITIONAL SUBSCRIPTIONS TO THE EDUCATIONAL FUND.—In our issue for the 7th inst. (p. 666) it was reported that the total subscription per annum, over the 5-year period, for the maintenance and development of the educational work proposed by the American Gas Light Association, amounted to $3,448. Since that record appeared the following additional subscriptions have been received :

Subscriber.	Total Amount Pledged.	Amount per Year Through 5-Year Period.
Rusby, J. M., Jersey City, N. J.....	$25	$5
United Coke and Gas Co., Pittsburg, Pa.....	50	10
Young, Percy, Jersey City, N. J.....	25	5

This brings the subscription, per annum for the 5-year period, up to $3,468. A scanning of the list as a whole brings to mind the unsatisfactory knowledge that the largest Gas Company in America (the Consolidated Gas Company of this city) has failed so far to appreciate in a practical way that the work of the Association on the lines proposed is of vital moment to the gas industry.

NOTES.—A correspondent, writing under date of November 5th, says : "I notice in the JOURNAL of recent issue an item to the effect that Mr. Edward Fish had leased the San Leandro (Cal.) gas and electric lighting plants. The given name is incorrect ; it should have read Edwin Fish. The item further states that Mr. Fish operated the plant at Redwood City, etc. You may be interested to obtain additional matter respecting these things. Mr. Fish organized the Peninsula Lighting Company, of San Francisco, using it to purchase the Redwood plant, which he subsequently enlarged sufficiently to enable it to supply the districts of San Carlos, Redwood City, Menlo Park, Palo Alto and Mayfield, which really meant the covering of 9 miles of territory. Having put the Company on a paying basis, Mr. Fish subsequently sold his control (amounting to about 80 per cent.) to a syndicate headed by Prof. E. M. Pease, of Stanford University (near Palo Alto), who is carrying on the good work. Mr. Fish is now in treaty for the ownership of the electric lighting plant at Haywards, Cal."——Advices from New Orleans are to the effect that the Birmingham (Ala.) By-Product Manufacturing Company has been incorporated, by Messrs. P. H. Smith and P. B. McKinney, of Atlanta, Ga.; and A. A. Smith and G. P. Bondurant, of Birmingham. It is said the Company has purchased 4 acres of ground, close to the Ensley City plant of the Semet-Solvay Company, and will thereon construct a factory to work up into merchantable shape the by-products produced by the latter. It is also understood that the new concern will be a bidder for coal gas tar produced by gas works at other points in the South and Southwest.——The properties and franchises of the Newton (Kas.) Light and Power Company have been purchased by local parties, who propose to operate their new holdings under the corporate title of The Gas and Electric Company of Newton. The gas division of the enterprise will be enlarged, which resolution virtually means the rebuilding of the plant.

The Darkest Capital in Europe.

According to the *Gas World*, the *St. James Gazette* has been devoting some of its space to an article descriptive of the lighting of London. The *Gazette's* penman, amongst other things, said : "Walk from the Griffin to Charing Cross [along the Strand] on a dark Sunday evening, and the part taken by the shop windows in the work of public lighting will be clearly revealed. Twenty years ago, when the first experiments with electric lamps were being made, the Embankment was far better lighted than it is now. The same somberness is noticeable in other streets which ought to be particularly light. Emerge, for instance, from one of the great hotels or clubs which line Northumberland avenue, and it is impossible not to be struck by a sense of the pervading darkness. In many of the West End streets—the western end of Piccadilly, for instance—where there are no shop fronts to eke out the lamps, the state of things is even worse. But every resident in London can compile a list of badly lighted streets from his own experience. The capital is, indeed, lighted far worse than many of the great provincial towns." The *Gas World* further says that the author is not enamored of the electric light as a street illuminant, for he points to incandescent gas lighting as a way out of the darkness in which the streets of the metropolis are involved after the sun sets. After describing the condition of the Strand when the shops are closed the writer gives as the cause of this state of things "a mixture of ignorance and indifference to better things on the part of the local authorities and the inadequacy of the means employed." Perhaps this short sentence sums up the position as fairly as it could be stated, and if the article succeeds in dispelling the ignorance and indifference it will have performed a good work.

[ABSTRACT OF PROCEEDINGS.—Continued from page 718.]

TWENTY-SIXTH ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

HELD IN THE INTERNATIONAL HOTEL, NIAGARA FALLS, N.Y., OCTOBER 19, 20 AND 21, 1898.

SECOND DAY, OCTOBER 20, AFTERNOON SESSION.

The Association reconvened at 2:30 P.M., and the President introduced Mr. H. L. Rice, of Norfolk, Va., who read the following short topic on

A GAS ENGINE IN A BLOWING PLANT.

In the fall of 1897 we remodeled our blowing plant, and installed a Westinghouse gas engine as our principal blowing engine. Our old Sturtevant upright steam engine became the auxiliary engine. These engines belt to the same countershaft, and operate a No. 6 Sturtevant blower. The gas engine is rated at about 25-horse power with a speed of 350, and has its speed cut down to 275 to give about 16-horse power. The steam engine is rated at 15-horse power, and appears slightly overloaded. The load is estimated at 16 horse power. For some time these engines have been running alternately, and a record has been kept of their relative performance. It is this record which your committee thought might be interesting. It is not pretended that this record is scientifically accurate, in the sense that a careful boiler and engine test is accurate. The gas plant was operated as usual, the engines being alternated at convenient intervals of about 10 days each, and the boiler fuel determined as carefully as possible. Three of these intervals are selected for each engine, during which no steam was required except in the regular operations of gas making. Periods in which the steam use was for any cause uncertain are not considered. The boiler fuel figures for these periods are as follows :

Steam Engine.

	1.	2.	3.	Average.
One-half screenings per 1,000.	4.47	4.65	5.33	
Coke per 1,000.....	3.14	....	....	
Coal "	2.42	8.16	5.76	
Total per 1,000.....	10.03	12.81	11.09	11.31

Gas Engine.

	1.	2.	3.	Average.
One-half screenings per 1,000.	4.79	4.80	3.41	
Coke per 1,000.....	3.12	....	....	
Coal "	0.54	5.18	5.37	
Total per 1,000.....	8.45	9.98	8.78	9.07
Gas per 1,000	14.70	15.67	14.64	15.00

The figures run closer than would appear at first sight, the variations being proportional to the hours of running the plant. This factor of gas making was distributed as evenly as possible between the two engines. Reducing the above to cents per 1,000, with coal at $2.51 per long ton and coke at $3.05 per net ton, we have :

Steam Engine.

	1.	2.	3.	Average.
One-half screenings per 1,000.	.6839	.7105	.8155	
Coke per 1,000.....	.4804	....	....	
Coal "	.2710	.9139	.6451	
Total per 1,000.....	1.4353	1.6244	1.4606	1.5068

Gas Engine.

	1.	2.	3.	Average.
One-half screenings per 1,000.	.7328	.7344	.8196	
Coke per 1,000.....	.4774	....	....	
Coal "	.0605	.5802	.3819	
Total per 1,000.....	1.2707	1.3146	1.2015	.12623

This leaves for 15 cubic feet of gas, .2345 cents, or 16.3 cents per 1,000. There is a difference of $\frac{4}{100}$ of a cent per 1,000 in favor of the gas engine in oil consumption, which is, however, closely balanced by the larger consumption of water. The above figures will be more readily understood if the actual performance of the gas engine is stated. In a run of 10½ hours, making 48 runs and blows, with a gas make of 168,000, the

gas engine will consume, under best conditions of steady running, about 2,400 cubic feet of 22-candle power water gas. This is 14.34 cubic feet per 1,000, or somewhat better than the test figures given above. The engine when not blowing is slowed down to half speed by means of a gas by-pass. It is a 2 cylinder engine, and runs steadily at this lowered speed, but cannot be slowed down more without danger of stopping. It is found to consume 340 feet per hour at full speed and 170 at half speed, the gas consumption between these limits being thus proportional to the speed.

The engine is blowing up about 216 minutes, and running slow 414 minutes, of the 10½ hours. It takes, therefore, 1,173 cubic feet of gas merely to keep the engine running, which cuts seriously into its economy. The steam engine can be slowed down much more radically, and we have, therefore, a larger average horse power with the gas engine than with steam. The gas consumption at full load is seen to be up wards of 20 feet per horse power. The engine is of the inclosed type, and closely resembles in general appearance the Westinghouse steam engine. This gas engine, having two or more cylinders, is more suitable for blowing purposes than a single explosion gas engine, in that it can be slowed down. Its igniters are rather delicate and require careful attention. It runs very steadily at all speeds. In fairness to this particular engine one more feature should be considered. As above stated, it is a 25 horse power engine with speed cut down. The Westinghouse people estimate the frictional loss at 14 per cent. Using this figure, were the engine 16-horse power, as is the steam engine, it would consume only 316 cubic feet per hour at full speed, and its gas revenue, compared with steam, would be 18.1 cents instead of 16.3 cents per 1,000.

An interesting discussion[1] (participated in by Messrs. A. S. Miller, Norris, Shelton, Egner, Littlehales, Searle, Walton Forstall, Ludlam and Rice) ensued.

The President then called upon Mr. Irvin Butterworth, of Columbus, Ohio, who detailed the following account of

AN EXPERIMENT WITH THE SHADBOLT SELF-ENRICHMENT PROCESS.

Having been requested to do so, I will give a brief account of an experiment made at the Columbus, O., gas works during the past summer with the Shadbolt self-enrichment process.

Not having been troubled with naphthaline for many years, our experiment was made solely with the view of securing, if possible, an increase in candle power.

The conditions were as follows: Coal gas only is made, our condensing and scrubbing apparatus being such that the candle power of the gas is about 17, with no enrichment whatever. We, however, enrich our gas to about 20 candles, by running 63° naphtha into our retorts, at the rate of about 5 gallons per ton of coal carbonized. It was with this enriched gas that our experiment was made. Candle power tests were carefully made by means of a bar photometer. Varying percentages of gas were taken from the inlet of the purifiers and returned to the exhauster inlet, the returned gas being carefully measured by means of a wet meter. The temperature of the gas at the exhauster inlet varied between 110° and 120° F., while the returned gas was nearly constant at 70°.

The same coal was used throughout the tests, and all conditions likely to affect the candle power were kept as uniform as possible.

The first series of tests covered a period of two weeks, during which the proportion of gas returned was varied from time to time between 6 and 16 per cent. of the make. There was no decided increase in candle power at any percentage, and the fluctuations thereof were slight, irregular and contradictory, and generally attributable to other causes than the varying proportions of gas returned.

The second series of tests covered a period of one week, during which no gas whatever was returned, while frequent and careful photometric tests showed the average candle power to be 19.88.

Other conditions remaining as nearly as possible the same, exactly 10 per cent. of the gas was then returned continuously for the following week, during which the third series of tests showed the candle power to average 20.02, being an increase of .14 of a candle, or 7 per cent.

The result was disappointing, as the increase was not deemed sufficient to pay for repumping 10 per cent. of the gas. It will be noted, however, that the experiments were by no means exhaustive, in that the returned gas was taken from one point only and returned to one point only. Had different points been tried, a combination might have been found productive of better results. It is probable, however, that self-enrichment by this method is possible only with a lean and unenriched gas of not more than 16 or 17 candle power.

Since the foregoing was written, however, a single but careful test was made at our works with the gas unenriched with naphtha, the other conditions remaining as in tests above described, except that only 8 per cent. of the gas was returned. The result was as follows:

Candle power with no gas returned.....	16.50
" " " 8 per cent. gas returned.....	16.65

The increase in this also was so slight that it could easily have been due to errors of observation or other causes than the return of a portion of the gas, and we conclude that under the conditions stated the Shadbolt process is not effective at our works.

The discussion on the Butterworth short topic was carried on by Messrs. Egner, Littlehales, Witherby, W. Forstall, W. H. White, W. A. Miller, Bredel and Butterworth.

The President introduced the Secretary (Mr. A. E. Forstall, of Montclair, N. J.), who read the following paper, entitled

CAN WE MAKE ALL OUR BUSINESS PAY?

In the early days of the gas business little attention was paid either to reducing the cost of manufacture or to developing the business. Later great stress was laid upon the necessity for economizing as much as possible at the works and bringing the cost in holder to the lowest practical point, but the sales' department was still apathetic. Only during the last decade has this department awakened to the fact that in the gas business, as in all others, the only way to sell any large amount of goods, and keep ahead of competitors, is to advertise your wares, seeking possible purchasers to present to them the advantages of your goods and demonstrate to them the benefits to be derived from patronizing you. In the present condition of the industry there can hardly be any doubt that, of equal amounts of energy applied in a well-equipped plant, respectively, to the decrease of cost of gas in the holder or the increase of amount sold, that given to the latter purpose will yield the larger returns in increased profits. But in striving after new business we may lose sight of other points connected with the sales' department that would repay consideration. Is it not possible that we are doing business that is not profitable; in fact, is not every company doing some business at an actual loss? And cannot a way be found to make this business profitable?

In an article entitled "Both Sides of the Ledger,"[1] Mr. N. H. Humphrys, of Salisbury, England, emphasizes the necessity of a careful examination of all the circumstances connected with each class of consumers, to determine its desirability and the extent to which it should be encouraged, and also to settle the question of what concession in price, if any, can be fairly granted for such encouragement. He notes the various factors affecting cost of service, such as the constant or intermittent nature of the demand for gas, the relation of time of maximum consumption to the peak of the load, which determines whether the particular business under consideration increases or diminishes the "load factor," the proportion between size of meter required and total amount of gas consumed in a year, and other more obscure factors to which it is hard to assign definite values. But, though calling attention to the necessity of care to avoid unprofitable business, he gives no advice as to the way in which business that is shown to be unprofitable by an examination based on his line of thought can be made profitable.

A key to the solution of the problem is given, however, by Mr. Walton Clark, in the paper "Meter Rents: A Question of Equity and Policy,"[2] read before this Association in 1891. In that paper the point is made that gas companies being granted certain rights, having their origin in the citizens of the State, these rights involved obligations to the public granting them, one of which is to make no distinction in their treatment of individuals served by them. In other words, no gas company is entitled to "Collect upon the investment necessary to the service of one customer an interest greater or less than is paid by any other customer upon the investment made in his behalf." Decisions of various cases in the U. S. Circuit Courts are cited as showing plainly that the profit made by corporations organized to do a public work must not be variable per unit of service rendered. From these premises Mr. Clark reasons that the equitable way of charging for the service furnished by a gas company is "To charge for each 1,000 cubic feet of gas an amount

1. The discussions on the short topics, and on the paper by Secretary Forstall as well, were not revised in time to admit of their publication in this issue of the JOURNAL.

1. *Journal of Gas Lighting*, etc., Vol. LXXI., pages 22 and 75; AM. GAS LIGHT JOURNAL, Jan. 31, 1898, p. 166.

2. Proceedings American Gas Light Association, etc., Vo . IX., p. 517; also AM. GAS LT. JOURNAL, Nov. 16, 1891, p. 686.

covering its proportion of the items of expense and interest common to the performance of the total service, adding to each bill so made the items peculiar to the individual service." The first portion of the charge should include the cost of supplying up to the inlet of the service pipe, including the amount per 1,000 cubic feet necessary for the payment of interest and dividends, and the second should be made up of the average cost of keeping the accounts, collecting the bills and attending to complaints, plus the interest and maintenance charges for the meter and service pipe employed for the particular consumer under consideration. Mr. Clark thought that while a change from the present method, of charging so much per 1,000 cubic feet, with various discounts for amounts above the average, to the method he advocated, would at first lead to friction with the consumers, in the end the easily demonstrable justice of the new method would insure an increase of popularity to the company adopting it.

At the time of its reading, this paper did not receive the attention it merited. Questions of business method had not then assumed the importance that has since been accorded them, and did not command the consideration given to problems arising on the technical side of the industry. But its arguments were strong and have lost none of their strength in the interval that has elapsed. Being a new comer into the field of office work the number of small consumers served at a direct loss to the company probably made more impression upon the writer than would have been the case had he grown up at the desk. Be this as it may, he was so much impressed that the subject of either doing away altogether with such consumers, or devising some method to make them profitable, has occupied a large share of his attention, and the more thought was put upon it the more it seemed advisable to follow the plan worked out by Mr. Clark, and to a certain extent applied by the electric companies in their system of minimum charges, and charge a certain amount for cost of service irrespective of the quantity of gas used.

In order to see how the change would affect our consumers, an analysis of the expenses was made, and the cost per consumer of keeping the accounts, collecting the bills, attending to complaints, etc., was determined. The meters were also listed by sizes and amounts registered in 1897. That is, so many 3 light meters under 1,000 cubic feet, so many between 1,000 and 2,000 cubic feet, and so on. For the purpose of this investigation it was not deemed necessary to take up each length of service, but only to take the average cost of maintenance. And the services having all been paid for by the consumers, no interest on their cost was figured, maintenance only being considered; in the absence of definite figures for the cost of such maintenance, it was assumed at 30 cents per year per average service of 60 feet in length. Interest, depreciation and repairs on meters were figured at 15 per cent. on first cost. Working out the charges on this basis, and taking all the figures in round numbers, it was found that the costs of service were as follows:

3-Light Meter,	$2.25	per year.		20 Light Meter,	$3.30	per year.	
5-Light	"	2.50	"	30-Light	"	3.80	"
10 Light	"	2.90	"	45 Light	"	4.90	"
				60-Light Meter,	$6.20	per year.	

Fixed charges of these amounts made upon the respective consumers would bring in a sum of money sufficient to enable us to reduce the price of gas 12 cents per 1,000 cubic feet, and still net the same profit. Making this reduction in the price of gas, and adding the charges, would cause all consumers of less than 19,000 cubic feet per year, through a 3-light meter, to pay more for their gas than at present, while those consuming more than that amount would pay less. For a 5 light meter, the dividing line would be at 21,000 cubic feet per year; for a 10 light, at 24,000 cubic feet; for a 20 light, at 28,000 cubic feet; for a 30 light, at 32,000 cubic feet, etc. With our conditions, the change would result in 63 per cent. of our consumers paying more for gas than they do at present, and in 37 per cent. paying less. In the case of the 6½ per cent. of meters that are passing from 100 cubic feet to 3,000 cubic feet per year, the increase in price might be so great, when figured per 1,000 cubic feet, as to cause the closing of the accounts; but as this business is now done at less than the actual cost of doing it, its loss would not be a source of any regret. However, even among this last there are some meters that would be retained, as the additional charge of $2 or so per year would be paid for the privilege of having gas to fall back upon in case of a failure in the electric light service. But in most cases the increase would be so small that it would hardly be noticed. Our figures show that of the 63 per cent. of consumers paying more, only 27 per cent. would pay over 10 cents per 1,000 cubic feet or $1 per year additional for the same amount of gas, a difference that would not attract any attention.

On the other hand, the larger consumers would individually derive a much greater benefit, since the loss of 63 is gained by 37. The largest consumer, through a 3-light meter, who burnt 79,000 cubic feet, would save $7 23 by the change, and the largest consumer, through a 5-light meter, burning 129,000 cubic feet, would save $12.98 per year.

While an increase of price to 63 per cent. of the consumers might at first sight seem very poor policy, if the change of method were made, as Mr. Clark suggests, simultaneously with a reduction of price independent of that due to the change, it would certainly be so arranged that there would be no actual increase except to the 6½ per cent. of consumers above noted who are burning little or no gas, but merely retain the meter as a convenience. There certainly can be no question as to the greater equity of the plan proposed compared to that now in vogue, and there does not seem to be any legal obstacle in the way of its adoption, except possibly in the case of those companies operating under franchises, municipal or otherwise, limiting closely the price to be charged per 1,000 cubic feet. It would not be possible to apply a fixed charge without making the cost per 1,000 cubic feet to some consumers greater than the price fixed by law, and this might prevent its adoption in such cases. But the majority of companies are not bound in this way. They are free to arrange their charges in any way that is just and reasonable. Can there be any way more just and reasonable?

Apart from theoretical arguments, have we not a very practical one in the custom of electric light companies? The company that controls the supply of electricity in our part of New Jersey will not install a meter unless the would-be consumer signs an agreement to pay at least $1 per month, even though, as may frequently happen in summer, no current is used during the month. They get business and are apparently making money. It would seem as if a charge of this kind, that appears to make the customer pay for something that he is not getting, would be more objectionable than a charge for cost of service that is being rendered. And what is sauce for the electric goose should serve as well for the gas gander.

If, then, the proposed system of dividing the charge for gas into the two items of cost per 1,000 cubic feet for expenses that are common to all consumers, and not dependent upon the number, and fixed charge for expenses that are peculiar to the individual consumer, and independent of the quantity consumed, is more equitable than the present plan of a single item of so much per 1,000 cubic feet, combining both general and special expenses in a common average price under which no two consumers pay the same amount for equivalent service, and the change, if properly timed, can be made without detriment to the popularity of the company, what argument can there be against its adoption? And if, as would seem to its advocates, the change would increase the popularity of the company, while making all its business equally profitable, instead of this being done partly at an actual loss, partly at a small profit, and partly at an excessive profit to balance the losses, there would seem to be very strong arguments in its favor.

The method outlined is not perfect. Among other things it does not recognize the difference between a certain consumption at a time of light load, as during the day in summer, and the same consumption at a time of heavy load, as in the evening in winter, though the former can certainly be supplied more cheaply than the latter. This can be met by differences in the charge per 1,000 cubic feet for gas used at the different times, the fixed charges remaining the same and separate meters being installed, or it can be ignored as is the case with many companies at present. But, though it does not cover all factors affecting cost of service, the proposed method of charging does away with all differences between users of gas for the same purposes, and substitutes for present arbitrary extra discounts to large consumers a perfectly fair and equitable premium to those who keep their meters working up to nearly full capacity. And it is again presented as an advance upon the crude method of charging which originated during the "dark ages" of the industry, with the idea that the present writing may supplement the original presentation, and in connection with it persuade us all to enter and follow the path of "equity and policy."

The paper brought out a brisk discussion, in which Messrs Littlehales, Searle, Boardman, the President, Butterworth, Shelton and the Secretary took part.

Mr. A. R. Foote, of Takoma Park, D. C., then addressed the Association on the importance of collecting statistics and references to matters pertaining to the relations of corporations to municipalties. Invitations to visit the great power house above the Falls, and to inspect the works of the Peoples Gas Light and Coke Company, were accepted.

The Question Box contents were read and discussed, the usual votes of thanks were passed, and the Convention was declared adjourned.

ROLL CALL.

Honorary.

Barker, F. E., Boston, Mass.
Foote, A. R., Takoma Park, D. C.
Love, E. G., New York City.

Active.

Adams, H. C., Philadelphia, Pa.
Africa, W. G., Manchester, N. H.
Barrett, A. H., Louisville, Ky.
Barrett, W. E., Ardmore, Pa.
Baxter, I. C., Detroit, Mich.
Beadle, A. B , Philadelphia, Pa.
Beal, W. R., New York City.
Bigelow, A. F., Allentown, Pa.
Blodget, C. W., Brooklyn, N. Y.
Boardman, A. E., Macon, Ga.
Borgner, C., Philadelphia, Pa.
Bowen, W. S., Newport News, Va.
Bredel, F., Milwaukee, Wis.
Brown, R. B., Philadelphia, Pa.
Buckman, J., Philadelphia, Pa.
Burke, J. E., Princeton, N. J.
Bush, J. S., New York City.
Butterworth, I., Columbus, O.
Callender, E. P., New York City.
Cartwright, W., Philadelphia, Pa.
Cathels, E., Hamilton, Ont.
Chollar, B. E., St. Louis, Mo.
Clark, W., Philadelpnia, Pa.
Clarke, G. S., Kansas City, Mo.
Clary, E. D., Burlington, Ia.
Corbett, C. H., Brooklyn, N. Y.
Cowdery, E. G., Milwaukee, Wis.
Cowing, J. H., Buffalo, N. Y.
Cressler, A. D., Fort Wayne, Ind.
Crisfield, J. A. P., Savannah, Ga.
Crockett, J. B., San Francisco, Cal.
Curley, T., Wilmington, Del.
Daly, D. R., Jersey City, N. J.
Dell, J., St. Louis, Mo.
Diall, M. N., Terre Haute, Ind.
Dickey, C. H., Baltimore, Md.
Dickey, R. R., Dayton, O.
Doherty, H. L., Madison, Wis.
Doty, P., Grand Rapids, Mich.
Dunbar, C. H., Elgin, Ills.
Egner, F., Norfolk, Va.
Eilbeck, A. B., Philadelphia, Pa.
Faben, C. R., Jr., Toledo, O.
Flemming, D. D., Jersey City, N.J.
Forstall, A. E., Montclair, N. J.
Forstall, W., Philadelphia, Pa.
Fry, C. G., Lynn, Mass.
Geggie, D. H., Quebec, Canada.
Gerould, C. L., Mt. Vernon, N. Y.
Giblin, J. A., Ilion, N. Y.
Glasgow, A. G., London, Eng.
Glass, S. J., Milwaukee, Wis.
Goodwin, W. W., Phila., Pa.
Greenough, M. S., Cleveland, O.
Gribbel, J., Philadelphia, Pa.
Guldlin, O. N., Fort Wayne, Ind.
Harbison, J. P., Hartford, Conn.
Harper, G. H., Altoona, Pa.
Harris, J. A., Philadelphia, Pa.
Helme, W. E., Philadelphia, Pa.
Herron, J. T., Buffalo, N. Y.
Humphreys, A. C., New York City.
Humphreys, C. J. R., Lawrence, Mass.
Jenkins, E. H., Buffalo, N. Y.
Jourdan, J. H., Brooklyn, N. Y.
Kellogg, L. L., Sioux City, Ia.
Keppelman, J. H., Reading, Pa.
Kreischer, G. F., New York City.
Leach, H. B., Taunton, Mass.
Learned, C. A., Meriden, Conn.
Little, F. W., Akron, O.
Littlehales, T., Syracuse, N. Y.
Ludlam, E., Brooklyn, N. Y.
Lynn, J. T., Detroit, Mich.
McDonald, W., Albany, N. Y.
McIlhenny, J., Philadelphia, Pa.
Miller, A. S., New York City.
Miller, W. A., Cincinnati, O.
Milsted, W. N., New York City.
Morrell, E. E., Oak Park, Ills.
Morton, F. N., Hoboken, N. J.
Neal, G. B., Boston, Mass.
Nettleton, C. H., Derby, Conn.
Norris, R., Philadelphia, Pa.
Nute, J. E., Fall River, Mass.
Pearson, W. H., Toronto, Canada.
Pearson, W. H., Jr., Toronto, Can.
Pinkney, E. A., Utica, N. Y.
Poor, F. B., Hackensack, N. J.
Pratt, E. G., Des Moines, Iowa.
Prichard, C. F., Lynn, Mass.
Quinn, A. K., Newport, R. I.
Ramsdell, G. G., Philadelphia, Pa.
Raynor, C. H., Adrian, Mich.
Reichelt, A. F., New York City.
Rice, H. L., Norfolk, Va.
Roots, D. T., Connersville, Ind.
Rowland, W. L., Phila., Pa.
Rusby. J. M., Jersey City, N. J.
Russell, D. R., St. Louis, Mo.
Searle, R. M., Atlanta, Ga.
Shelton, F. H., Phila., Pa.
Sisson, F. N., Albany, N. Y.
Slater, H. C., Milwaukee, Wis.
Somerville, Jas., Indianapolis, Ind.
Stacey, Wm., Cincinnati, O.
Strecker, A. H., Newark, N. J.
Summers, T. W., Hornellsville, N. Y.
Thwing, O. O., St. Louis, Mo.
Warmington, D. R., Cleveland, O.
Watson, Chas., Camden. N. J.
Weber, Oscar B., N. Y. City.
Wheeler, F. B., Binghamton, N.Y.
White, H. H., Portsmouth, Va.
White, Wm. Henry, N. Y. City.
Woods, Geo. E., New York City.
Wortendyke, I. F., Janesville, Wis.
Young, J. M. H., Pittsburg, Pa,
Young, John, Allegheny, Pa.
Young, Peter, Buffalo, N. Y.
Young, Robt., Pittsburg, Pa.

Associate.

Carpenter, H. A., Allegheny, Pa.
Collins, D. J., Philadelphia, Pa.
Crane, W. M., New York City.
Eaton, A. B., Chicago, Ills.
Graves, G. W., Rochester, N. Y.
Hartenfels: P., New York City.
Hayward, S. F., New York City.
Henderson, E. H., Pittsburg, Pa.
Knight, C. S., Fort Wayne, Ind.
Mansur, J. H., Royersford, Pa.
McDonald, D., Albany, N. Y.
Norton, H. A., Boston, Mass.
Osius, G., Detroit, Mich.
Page, A. L., New York City.
Pearson, J. A , Philadelphia, Pa.
Persons, F. R., Toledo, O.
Prendergast, D. R., New York City.
Roper, G. D., Rockford, Ills.
Wells, F. K., Chicago, Ills.
Wharton, H., Philadelphia, Pa.
Wilbraham, J. S., Philadelphia, Pa.

(To be Concluded.)

Water Tube Boilers in Blast Furnace Practice.

This subject was discussed by J. H. Ashby at a recent meeting of the Cleveland (England) Institution of Engineers. The author stated that recent excavations at Pompeii show that water tube boilers were in use over 2,000 years ago, but the first of modern times was invented by William Blakely, in 1766. They were under consideration and in use as early as any of the cylindrical type. For many years the boiler most largely used in the Cleveland district in conjunction with blast furnace gases was the egg ended or flash flue boiler, and there are still a considerable number working at the present time. These were followed in some cases by Cornish or shell boilers, with one internal flue. These again were succeeded by Lancashire or 2 flued boilers, and the 3-flued Lancashire boilers have met with a large measure of favor as well, so that there has been an advance from a plain cylindrical boiler to a cylindrical boiler having first one flue, then two, and then three flues, each one claiming for itself a higher economy than its predecessor. A multitubular boiler may be adopted readily, provided it can be maintained at a low cost for maintenance, and that it can be satisfactorily cleaned internally and externally. The objections to some types of water tube boilers have been the trouble of making the joints, which require packing rings and endless repairs to the brickwork, owing to the boilers resting more or less on the brickwork, instead of being suspended independently, as in the case of the Babcock & Wilcox boiler, and the want of efficient means of cleaning the boilers whilst they were working, which become for this reason choked with dust, and lose a large percentage of their evaporative capacity. The question of cleaning is most important where blast furnace gases are used, as the accumulation of dust in the flues caused serious loss in the evaporative power of any of the Lancashire type of boilers within a few days of their starting work after cleaning. This deterioration in evaporative power in some cases amounts to as much as 30 per cent. in 30 days, which is the usual period between cleaning. With the Babcock & Wilcox boiler the external cleaning can be performed daily.

For the economical burning of blast furnace gases the combustion chamber should be of ample area to allow of the free combustion of the gases before coming in contact with the heating surface of the boilers, for after coming in contact with the cooler water surfaces of the boiler no further combustion can take place, so that if not completely burned in the combustion chamber, a considerable amount of valuable gas passes away unburnt to the chimney and is often seen blazing at the tops of the stacks. A large combustion chamber allows the gases plenty of room to expand, and at the same time drop a large amount of dust carried over from the furnaces.

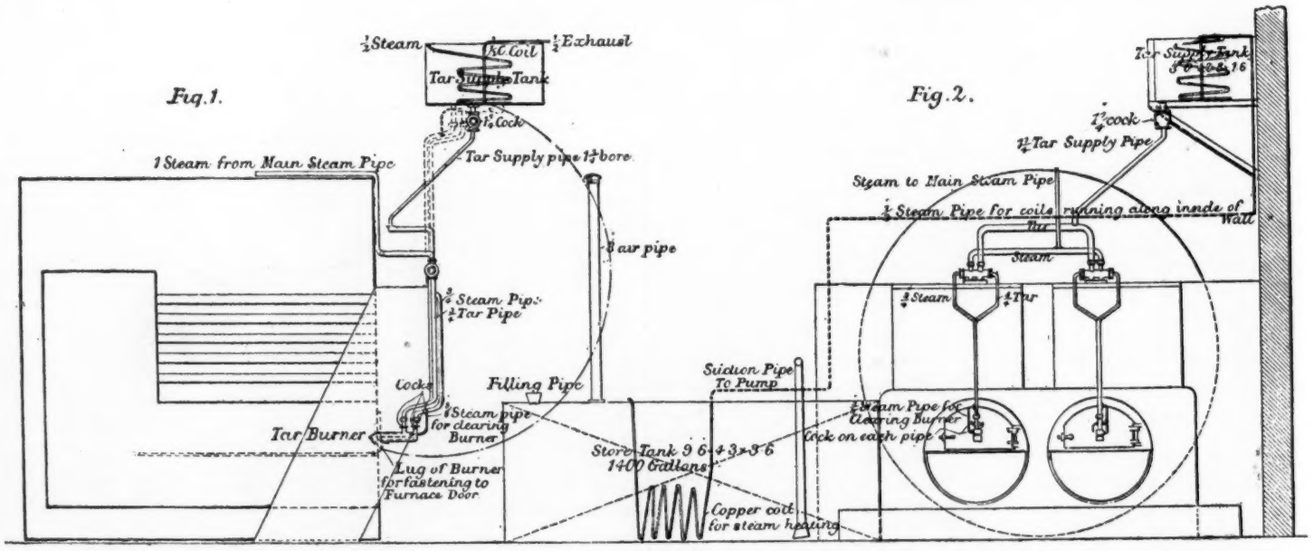
In the case of gases from hematite ores, where there is a considerable amount of moisture carried over, the heat retained by the brickwork and a suitably designed combustion chamber largely facilitates combustion. The conditions under which the furnace is working, and the quality of the gas to be consumed, largely govern the size of the chamber. If the air necessary to the combustion of the gases can be heated before mingling with the gases a very much more complete combustion will ensue, and this can be readily attained without additional outlay.

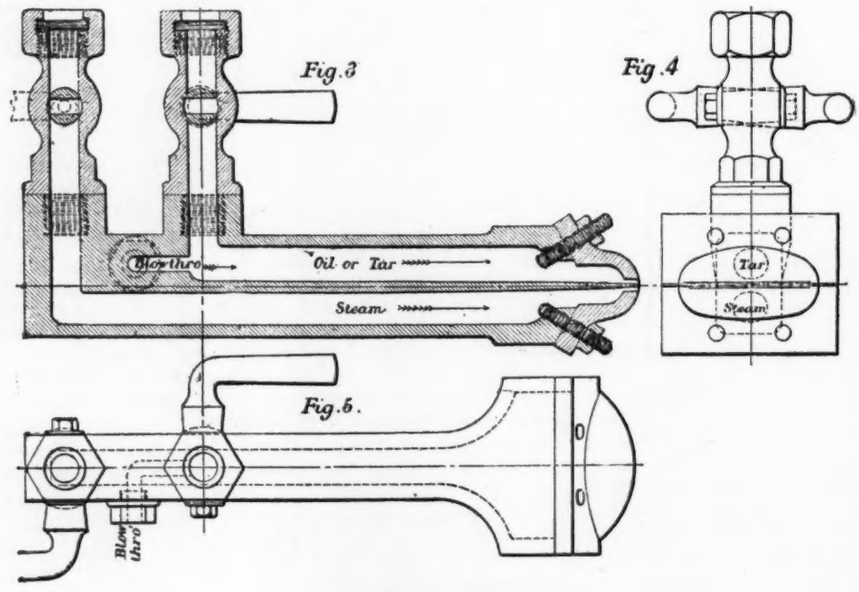
With coke oven gases a large amount of heat which would otherwise be lost can be recuperated by converting this heat into steam. In connection with coke ovens, gases of considerable lower temperature than those of blast furnaces are dealt with, and the water tube boiler, on account of its thin heating surfaces, and its ready transmission of this heat, can utilize such gases to the best advantage.

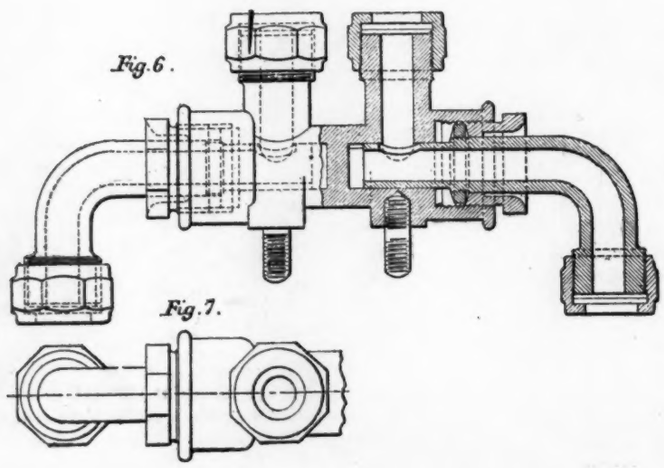
Regarding reheating furnaces, it is and has been the common practice to use as much of the escaping heat as possible from reheating furnaces in rolling mills for the purpose of raising the steam necessary for driving the engines without hand firing, and for this purpose Lancashire, Rastrick and also inverted egg-ended boilers, have been largely in use. The heat at disposal is not used to the best advantage. With the inverted egg-ended and Rastrick boilers only a small proportion of heat can be utilized, owing to the small amount of heating surface exposed to the waste gases. With the Cornish or Lancashire type of boiler, the fixing of these reheating furnaces necessitates a very large amount of brickwork, and also heavy girders for carrying the same ; and even when so fixed it is hardly possible to get more effective heating surface than is represented by the internal flue, and the building of side or return flues entails a large amount of brickwork, extra weight and correspondingly heavy supporting columns. With the Babcock and Wilcox type very light girders are necessary, and a much greater heating surface can be exposed to the action of the gases than in any of the shell type, and the casing can be constructed of light steel plates, with fire brick or silica lining ; so that, beyond the saving in space, a comparatively small weight has to be carried.

Tar Burners for Marine Boilers.

The description and illustrations, which are from *Engineering*, show an arrangement for utililizing coal tar as fuel, which has been adopted by Mr. Edmund Shurer, the General Manager of the Fairfield Ship Building Yard at Govan. Figs. 1 and 2 show the boiler in section and elevation, with the tar burning apparatus attached. The large store tank to hold 1,400 gallons is placed conveniently, and it is fitted with a small steam coil for keeping the tar in a sufficiently liquid state to insure it pumping freely. From this main tank the fuel is pumped into a small supply tank placed inside the building, and above the level of the burners as shown. In this tank there is also a small steam coil. The tar runs from the supply tank directly into a jointed coupling, shown in detail in Figs. 6 and 7, fixed to the front of the boiler, into which also is led a steam pipe for supplying the requisite pressure. From this coupling the tar fuel and steam pass in two ⅜-inch pipes down to the







burner itself. The form of the burner is clearly shown in Figs. 3, 4 and 5, the blow-through being fitted to clear out any tar which may gather while the apparatus is not in use. The steam valve is first opened and the burner cleared of any obstruction. The tar supply is then turned and the light applied.

This arrangement of burning liquid fuel has been applied for some time to one of the ordinary boilers working the hydraulic machinery for the shipbuilding works, and a comparison has been made as to the difference in cost of working with tar versus coal. In the latter case, including firemen's wages, the cost works out at $39.62 per week for double shift, and, taking the same time with the refuse tar as fuel, the cost works out at $29.88; thus showing a considerable saving. The only difficulty in the way of using the liquid fuel is that it is necessary to raise a certain amount of steam on the boiler so as to get the steam jet. The weight of coal used for 116½ hours is 15 tons, and the amount of tar used for the same period is under 9 tons. This comparative cost is for coal at $2.50 per ton, while the tar is assumed at $1.25 per 100 gallons.

The Determination of Sulphur in Asphalt.

By Mr. E. H. Hodgson, in *Jour. Am. Chem. Soc.*

The numerous articles recently published on the analysis and chemistry of asphalts, and the wide range of opinion as to the relative values of the different methods in use for the determination of sulphur, have led me to make a comparison of results on some typical asphalts.

Dr. E. H. Miller, through the kindness of Mr. A. W. Dow, of Washington, was enabled to secure samples, the sources and nature of which were known. The samples were labeled

Trinidad Lake, Trinidad Crude, Trinidad Lake Refined, Cuban Crude, Alcatraz Crude and California Crude, and were described by Mr. Dow as follows:

Trinidad Lake.—Asphalt from the lake on the island of Trinidad, imported by Barber Asphalt Company for paving.

Trinidad Crude.—Crude asphalt from Hadley's Diggings, about one mile from Trinidad Lake. It is known as "iron pitch," being the hardest asphalt found in Trinidad.

Trinidad Lake Refined.—This is crude Trinidad Lake asphalt, melted up to drive out the water.

Alcatraz Crude.—From Ventura county, Cal., used by the Alcatraz Asphalt Company for paving, after the addition of liquid asphalt.

California Crude.—From Kern county, Cal., used by the Standard California Asphalt Company for paving, after the addition of liquid asphalt.

Sample "Trinidad Lake" was found to lose water very rapidly, so it was heated to about 60° C. (not sufficient to melt it) and then remained constant.

The samples were ground as fine as possible in a mortar, and then placed in glass bottles, fitted with tight corks. From these bottles average samples were taken and kept in test tubes for use.

Heating with Strong Nitric Acid in a Sealed Tube—Carius' Method.—The tubes were made in the usual way from heavy glass tubing. Two determinations were made on each sample. One on one-half gram and one on three-fourths gram. A general description of the method is as follows: One-half gram of asphalt is introduced into the bottom of the tube, and 15 cc. of fuming nitric acid (1.60 sp. gr.) is poured upon it. The open end of the tube is then drawn out into a thick-walled fine-caliber tube, but not sealed. The tube is then heated for about 6 hours in a water bath kept at 80°–90° C. Then 5 cc. more acid are added, the tabe is sealed and heated in a guarded furnace at a temperature of about 150° C. for from 4 to 5 hours. Allow the tube to cool, then open and reseal, and reheat from 2 to 4 hours at a temperature of 180°–200° C. Cool, open, and remove the liquid and residue into a No. 2 beaker. Dilute with water, filter and wash. If the residue contains anything but sand it is saved and treated separately. The filtrate is evaporated to dryness on the water bath, adding a piece of solid sodium hydroxide. The nitric acid is driven out by repeated evaporation of the solution, with the addition of hydrochloric acid, and the silica dehydrated in an air bath at 110°–115° C. Cool the dehydrated mass, add 2 to 3 cc. of hydrochloric acid and 100 cc. of water, stir well, filter and wash well with hot water. Dilute the filtrate to about 200 cc., heat to boiling and while boiling add 20 cc. of barium chloride (20 per cent. solution), drop by drop, from a burette, at the rate of about a drop a second. Stir all the time. Boil the solution about 10 minutes, and allow it to stand 24 hours. Filter, wash with hot water and ignite. Treat with sulphuric acid and reignite. Then cool and weigh the barium sulphate. A pure white product was obtained and the precipitate did not run through the filter.

The residue from the sealed tube, if not thoroughly oxidized, is fused with 6 grams of mixed carbonates and 1 gram of potassium nitrate. The fusion is dissolved in water and hydrochloric acid. The nitrates are destroyed by evaporating with the addition of hydrochloric acid, and the silica dehydrated as before. Filter off the silica and wash. Then determine the sulphuric acid in the filtrate as before described.

When three-fourths gram of asphalt was used, 25 cc. of fuming nitric acid were employed instead of 20 cc. The following results were obtained:

	Weight of Barium Sulphate. Gram.	Sulphur. Per Cent.
Trinidad Lake—		
One-half gram	0.1526	4.192
Residue	0.0051	0.140
		4.332
Three-fourths gram	0.2238	4.10
Residue	0.0068	0.18
		4.28
Trinidad Crude—		
One-half gram	0.1249	3.400
Residue	0.0034	0.086
		3.486
Three-fourths gram	0.1720	3.148
Residue	0.0106	0.19
		3.338
Trinidad Lake Refined—		
One-half gram	0.1585	4.35
Residue	....	....
		4.35
Three fourths gram	0.2160	4.21
Residue	0.0137	0.25
		4.46
Cuban Crude—		
One-half gram	0.1315	3.61
Residue	....	....
		3.61
Three-fourths gram	(No results.)	
Alcatraz Crude—		
One-half gram	0.1839	5.05
Residue	0.0195	0.54
		5.59
Three-fourths gram	0.2749	5.12
Residue	0.0294	0.46
		5.58
California Crude—		
One-half gram	0.2589	7.11
Residue	0.0145	0.398
Three-fourths gram	(No results.)	

Deflagration Method—S. F. and H. E. Peckham.—A porcelain crucible is heated to a dull red heat, and *small* amounts of a mixture of 1 gram finely ground asphalt, 8 grams of potassium nitrate, and 8 grams of mixed sodium and potassium carbonates, added from time to time, just keeping the material in the crucible melted. When all of the mixture has been added, heat to perfect fusion with a blast lamp, and cool. Dissolve the fusion in 20 cc. hydrychloric acid and 40 cc. of water, and wash the crucible well with hot water. The solution is evaporated down to dryness, dehydrated at 110°–115°, the silica filtered off, and the sulphuric acid determined in the filtrate as before. The results are as follows:

	Weight of Barium Sulphate. Gram.	Sulphur. Per Cent.
Trinidad Lake—		
No. 1	0.2770	3.804
" 2	0.2689	3.68
Trinidad Crude—		
No. 1	0.2443	3.37
" 2	0.2359	3.24
Trinidad Lake Refined—		
No. 1	0.2634	3.62
" 2	....	....
Cuban Crude—		
No. 1	0.2009	2.76
" 2	0.2052	2.82
Alcatraz Crude—		
No. 1	0.3054	4.19
" 2	0.2773	3.81
California Crude—		
No. 1	0.4376	6.50
" 2	....	....

Sodium Peroxide Method.—Place 1 gram of the fine asphalt in the bottom of a large nickel crucible. Cover with a layer of about 4 grams of mixed carbonates and about 1 gram of solid sodium hydroxide. Cover the crucible and heat gently until the gases are driven off. Then raise the heat and add small amounts of sodium peroxide, from time to time, until no further action is noticed on the addition of fresh Na_2O_2. Then, with the blast lamp, heat to perfect fusion. This takes but a few minutes. Pour as much of the fusion as possible upon the cover of the crucible and cool slowly. Place the fusion, crucible, and cover in a casserole containing 50 cc. hot water, and after thorough digestion on the water bath, filter off the residue, and wash well with hot water. The filtrate is made acid with dydrochloric acid, and evaporated down to dryness, dehydrated at 110°–115° C., the silica filtered off, and the sulphuric acid determined in the filtrate as already described. Result by this method:

	Weight of Barium Sulphate. Gram.	Sulphur. Per Cent.
Trinidad Lake—		
No. 1	0.2687	3.69
" 2	0.2744	3.77
Trinidad Crude—		
No. 1	0.2426	3.33
" 2	0.2360	3.25
Trinidad Lake Refined—		
No. 1	0.2962	4.07
" 2	0.2929	4.02
Cuban Crude—		
No. 1	0.2256	3.10
" 2	0.2230	3.06
Alcatraz Crude—		
No. 1	0.2887	3.97
" 2	0.2880	3.96
California Crude—		
No. 1	0.4557	6.26
" 2	0.4481	6.15

Ignition with Calcined Magnesia—Eschka's Method.—One gram of finely ground asphalt is intimately mixed with 1 gram of calcined magnesia and about ½ gram of dry mixed carbonates is added. Mix well and place in a platinum or porcelain crucible. With the crucible in an inclined position, heat at a dull red heat, stirring every few minutes until the ash is a dull yellow. Cool and add about 1 gram of finely ground ammonium nitrate and mix thoroughly. Heat slowly to a dull red, and continue the heating until the ammonium nitrate is entirely decomposed. Cool, extract the mass thoroughly with water (hot water preferred), filter and wash well. Acidulate the filtrate with hydrochloric acid, and precipitate the sulphuric acid as before described. The results are as follows:

	Weight of Barium Sulphate. Gram.	Sulphur. Per Cent.
Trinidad Lake—		
No. 1	0.2660	3.65
" 2	0.2791	3.83
Trinidad Crude—		
No. 1	0.2608	3.58
" 2	0.2567	3.53
Trinidad Lake Refined—		
No. 1	0.2744	3.77
" 2	0.2650	3.64
Cuban Crude—		
No. 1	0.2020	2.77
" 2	0.1941	2.66
Alcatraz Crude—		
No. 1	0.3054	4.19
" 2	0.3021	4.16
California Crude—		
No. 1	0.5011	6 88
" 2	0.5109	7.01

The relative accuracy of the different methods is best shown by tabulating the results, as follows:

	Trinidad Lake.	Trinidad Crude.	Trinidad Lake Refined.	Cuban Crude.	Alcatraz Crude.	California Crude.
Sealed tube	4.33	3.49	4.35	3.61	5.59	7.51
	4.28	3.34	4.46	....	5.57	....
Deflagration	3.80	3.37	3.62	2.82	4.19	6.50
	3.68	3.24	....	2.76	3.81	....
Peroxide	3.69	3.33	4.07	3.10	3.97	6.26
	3.77	3.25	4.02	3.06	3.96	6.15
Eschka's	3.65	3.58	3.77	2.77	4.19	6.88
	3.83	3.53	3.64	2.66	4.16	7.01

It would appear, therefore, that the "sealed tube" gives the most accurate results, but on account of the explosion of the tubes and the time required for a determination, it would probably be barred out.

The deflagration method apparently gives low results. It is much shorter than the sealed tube, but longer than either the peroxide or Eschka's method.

Of the latter two, the Eschka's method is perhaps the better, as it requires less time and attention to carry out, and gives about as good results.

The peroxide method is shorter than the deflagration method and about as accurate.

The reagents employed were first tested for sulphur.

	Sulphur. Per Cent.
The sodium and potassium carbonate contained	0.005
The sodium peroxide contained	0.003

The rest of the reagents were sulphur free or contained but the merest trace.

Carbureting Lamp.

On the 1st inst. U. S. Letters Patent (No. 613,419) were granted to Mr. Walter J. Kidd, of Newark, N. J., for "a new and useful carbureting lamp." Using the words of the specification:

The invention appertains to that class of carbureting lamps in which heated gas is employed to vaporize a heavy hydrocarbon.

The objects of my invention are, first, to produce a cheap and simple form of carbureting lamp suitable for attachment to existing chandeliers, gas drops, or brackets; secondly, to provide a suitable construction both for the heating of the gas and the regulation of the extent of carburation of the same; thirdly, to provide a convenient and centrally located shade support.

Hitherto where heated gas has been made to impinge on the surface of naphthaline or other heavy hydrocarbon for the purpose of vaporizing the said hydrocarbon, the gas has been raised to the required temperature, either by the direct heat from the gas flames coming in contact with the pipe or chamber in which the gas was heated, or else the said pipe or chamber has been heated by a body of hot air retained around it by a heat arrester or casing, there being a space between the casing and the pipe or chamber. A principal part of my invention consists in using conducted heat in place of the aforesaid direct heat or bath of hot air. I convey the heat from the gas flames to the gas heating pipe or tube by means of a simple heat conducting device, in the form of a laterally projecting plate having a close fitting collar, surrounding and in contact with the gas inlet pipe, the lateral flange being located above the level of the gas flames and adjacent thereto. By this means the devices for heating the gas can be much simplified and are also much less expensive.

In the drawings, Figure 1 is a view, partly in section and partly in elevation, of my improved apparatus. Fig. 2 is a top view of the laterally projecting heating plate.

In the drawings similar numbers refer to similar parts.

The carbureting lamp is attached by coupling 2 to the outlet 1 of an ordinary gas fixture. The gas channel is continued along the bent tube 3, elbow 4, and vertical descending tube or gas heating pipe 5, which latter passes into the upper part of the shell 6 containing the naphthaline. Around the lower part of the vertical pipe 5 is rigidly and permanently attached a casing 7. This casing has an annular chamber 8 surrounding the gas tube 5 and communicates both with the carbureting vessel and with the burner tip 9. The shell 6 is detachably suspended at its neck 10 to the casing 7 by a screw inlet or opening 11, which engages the external screw thread 12 on the casing 7. When the shell is screwed into position, it is made gas tight by coming in contact with asbestos washer 13, which fits into a recess in the casing 7. The neck or opening at the top of the carbureting vessel 6 thus serves as a filling orifice for replenishing the shell with naphthaline, and the shell, being detachable in the manner described, may be conveniently removed for the purpose of refilling without disturbing the fixed upper portion.

Located at the upper part of the tube 5 and above the gas lamp (indicated by dotted lines at 14) is a horizontal flange or heat conducting plate 15, which is preferably a light iron casting. A plan or top view of this plate is shown in Fig. 2. It will be noticed that in the form shown in the drawings the plate passes outside the gas tube 5, being fitted thereon by a close fitting collar 16 in continuous contact with the tube 5 for the purpose of more readily conducting and distributing the heat over the surface of the gas heating tube. The heat conducting plate projects on one side laterally and horizontally above the flame. At the edge farthest from the tube 5 the plate has a small flange 17, turning downward. This heat conducting plate can be raised or lowered to any desired position on the tube 5 and can be fixed where required by means of a set screw 18, which passes through the collar 16. In the case of a single gas jet I prefer the construction shown in the drawings, in which it will be noticed that the heat conducting plate projects on one side only of the tube and is longer on the line of the axis coinciding with the horizontal length of the flame. When

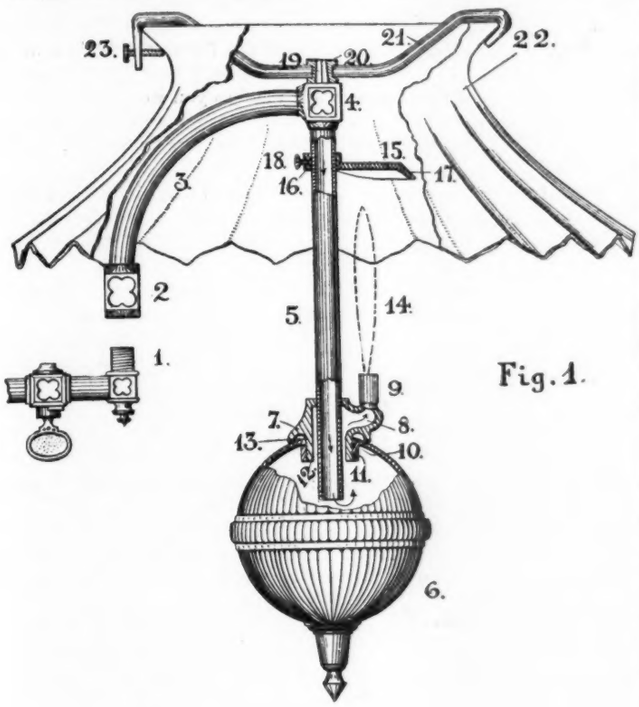


Fig. 1.

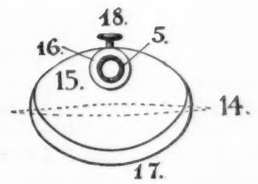


Fig. 2.

flames are located on various sides of the tube 5, a circular plate may be employed.

A vertical projection or shade holder support 19 rises from the elbow 4. It is rigidly connected with the elbow and is preferably cast integral therewith. It supports a ring 20, to which may be brazed or otherwise secured the ends of the shade holder rods or wires 21, which clamp the lip of the shade 22. One of the shade holder arms or wires is provided with a set screw 23 to properly secure the shade. The shade holder, with the ring 20, can be readily taken off the shade holder support 19. A loose thread may engage the two parts, or, as shown in the drawings, the vertical projection may be wedge-shaped and the interior of the ring made to fit the wedge-shaped projection. In this way the shade and shade holder can be instantly lifted off the fixed support, while at the same time they are steadily secured when in position. The shade holder is in this way detachably connected with its fixed support. The operation will be as follows: After the lamp is connected to the gas fixture outlet 1 the gas will pass through tubes 3 and 5 into the carbureting vessel 6, and thence through the annular outlet channel 8 to the burner tip 9. The gas flame highly heats the laterally projecting, heat conducting plate 15, which, being in close contact with the tube 5 at the collar 16, conducts the heat very effectively to the gas tube 5. Some heat is also given to the tube 5 by radiation from the flame. The incoming gas, passing through the highly heated tube 5, becomes heated in turn and after melting and vaporizing the naphthaline contained in the shell 6 passes, with the vapor therefrom, to the burner tip, giving to the flame the enrichment due to the hydrocarbon.

The laterally projecting plate may be of any convenient shape and may be inclined more or less from the horizontal; but I prefer to employ a horizontal plate provided with a slight flange, as shown in the drawings. When the heat conducting plate is raised to a higher point above the flame, it receives less heat therefrom, and thus by raising or lowering the heat conducting plate the gas may be heated less or more. In this way the extent of generation of naphthaline vapor can be regulated.

In the construction herein described the laterally projecting plate serves the special purpose of conveying heat by conduction to the gas heating tube, and thus raises the gas passing through said tube to a high temperature to enable it to melt the hydrocarbon in the carbureting vessel. It is thus a gas heating device. It differs also from a bell or casing around the heated pipe in that it does not retain a bath of hot air around the pipe. A shallow horizontal heat conducting plate has an advantage over a longer bell shaped casing in that it enables the gas heating tube to be shorter and thus make the small lamp more compact. At the same time the construction is less expensive.

It will be noticed that the location of the shadeholder support and the bent gas inlet tube 3 enables the shade to be both centrally located and also outside of the gas channels forming part of the lamp. In this way an exceedingly simple, symmetrical and compact construction of lamp is secured.

The claims of the inventor are:

1. In a carbureting lamp, the combination of a carbureting vessel, a gas burner, a vertical descending gas inlet tube 5, located above the carbureting vessel, said inlet tube entering at the upper part of the vessel, and being rigidly attached to a burner casing 7, supporting the vessel; and a laterally projecting flange or heat conducting plate, located around, and in continuous contact with, the said descending gas inlet tube, at the collar of said flange, and situated above and in proximity to the gas burner, and below the upper end of the vertical descending inlet pipe 5, substantially as and for the purposes described.

2. In a carbureting lamp, the combination of a gas burner; a vertical descending gas inlet tube 5, located above the carbureting vessel, and entering at the upper part thereof; a laterally projecting flange located around and in continuous contact with the said descending inlet tube, at the collar of said flange, and situated above, and in proximity to the gas burner and below the upper portion of the vertical descending tube 5, said projecting flange being vertically adjustable upon the gas heating pipe, by a sliding movement thereon, and by means of a suitable set screw; and a carbureting vessel, located below the fixed upper portion, and detachably suspended therefrom at the screw-fitted neck, substantially as and for the purposes described.

Playing with Acetylene.

"Gasometer," writing for the *Metal Worker*, says there is an old saying in reference to a man out hunting that a fool and a gun is a ruinous combination. The same sort of a combination is effected when a man, or, more correctly speaking, a fool, goes hunting a gas leak with a candle. There is always a possibility of the gun not being loaded, though the "didn't know it was loaded" man is to be avoided. With illuminating gas there is never any case of empty gun. It is always loaded, whether made from coal and enriched, washed and scrubbed, or from gasoline of 75, 90 or 150 test, or from just sprinkling carbide, which gives acetylene.

It appears that acetylene is a high power gas and, so to speak, quick on the trigger. Being new and all sorts of machines being made for generating the gas, people of an inquiring turn of mind are finding out about it, even though the chronic croaker has warned them against new fangled things and has his "I told you so" ready to spring promptly. The people have found out that a good light can be had with it and the sale of the apparatus is on the increase—another case of merit overcoming conservatism. Some mischief has been done by it when the investigations have been conducted with but one idea in view without due consideration of possible results. In one case the principal storekeeper in a large town had a lighting system put in his store and with all reasonable precaution. He ran an exhaust pipe from a safety valve outside of his building so that any surplus of pressure could have vent. Two boys wanted to know what the pipe was for and one climbed on the other's shoulders and got a whiff. He said gas. His companion remarked, "See if it will burn." A match was applied, with a slight damage to the generator. In another instance the owner of a generator and his son knew there was a leak, because acetylene has an odor of its own, and concluded they would locate it with a candle, and that it was found may be conceded, for a part of the machine was blown off and stove in a rib or two for the man and burned his son's fingers.

There may be some excuse for these two catastrophes, as they were conducted by laymen, but when a blunder is made by the plumber whose specialty is gasfitting, and who has taken the agency for a generator and is pushing its sale in his neighborhood, there seems to be little room for excuse. A newspaper item describes how such a plumber and his workman started the plant going, and to make sure that all was right did not use their noses, but stuck a candle where leaks were likely instead, and both had some of the lectures of their apprenticeship brought vividly to mind. This is the time of year when gas from various sources is largely used for illumination, and a word of caution about the use of a candle seems necessary.

There is no doubt but the candle will find the leak, but as it may bring disaster with it the sensible man should leave it out of all searches and tests he may make, particularly if there is a strong smell of gas. Acetylene seems to be what the people call a "good thing," and there are always all sorts of people who take advantage of a good thing to make something to sell cheaper than a first-class production can be sold. These manufacturers pay no attention to explaining what is to be avoided. Their whole energy is devoted to making sales. Acetylene has merits and its use will increase, consequently those who know its peculiarities must caution all who show any curiosity about it that it must be handled so that its powers are always under perfect control. This is simply to obey implicitly the rules given for the setting and operating of the machines.

Mending Defective Iron Castings.

[By Mr. T. F. Kennedy, in *Metal Worker*.]

A very small hole or other defect in a stove casting, one which may not detract from its strength in any way, will cause it to be condemned unless it can be mended securely, and so neatly as to defy detection. In very few stove foundries is the mending of defective castings encouraged. In a great many it is tolerated but discountenanced; in some it is regulated—If a molder wants to mend a piece he must show it to the foreman and get his consent.

It is not anything inherent in the practice itself, but the slipshod and often dishonest mending done by molders, that has caused managers of stove foundries to look with suspicion upon all mending. This to a large extent has the effect of throwing those molders who are least fitted for it on their own resources to devise ways and means to remedy defects, which if the manager tolerates it at all he is interested in having well done. A great many castings are lost which could be saved if managers would accept the inevitable and recognize mending as a necessary incident in the making of stove plate castings, while placing the standard for such work so high that there would be a margin for any possible contingency.

A composition called "gumbo," composed of gum arabic, plaster of paris and iron filings, is used by molders in mending defects. It is very unreliable, and its use in any manner is fraught with danger to the reputation of a house in these days of sharp competition, and is forbidden in all foundries of which I have any knowledge. Still it is used, and while the piece may get past the inspector it is liable to fall out any minute. Rivets are another thing used in mending holes, but they can be used in very small ones only, and the time and trouble required to secure them and give them a presentable appearance makes them of doubtful utility.

The most important and useful of all methods of mending is what the molders call "burning." The piece to be mended is pressed into the sand, face down, with sufficient force to get a good impression and make the sand as solid as it would be in a mold, then drawn out and the point under the hole, if hole it be, is sleeked off flush with the surrounding surface, the piece returned to the same place, and while one man stands by with a clamping bar or some such tool, another catches a little molten iron which he pours, at first into the hole, and then on top of that which he first poured, continuing until he believes it is "burned," when he gives the word to his partner to strike it off. The latter with his clamping bar rubs—if he can—the superfluous iron off flush with the body of the casting. Sometimes it results in a good mend, but not as a rule. There are a few variations from this, such as inclining the casting a little and building sand around the hole; but the description given is substantially correct of the method in vogue in every stove foundry I have ever worked in, and, I submit, bears out the assertion made in the first paragraph of this article that the methods are crude.

A better method is as follows: Get a little iron frame 2 inches deep and 3 inches square, slightly tapering toward one end. Cast iron is best owing to its rigidity, but sheet iron will do. Press the piece to be mended face downward into the sand so the defective point will lie firmly on it, lift it off and smooth the point under the defect, or if the defect is only a small hole a piece of paper can be placed so as to prevent the sand from entering. If the mend is at a particular point, or if it is a flange or lug we want to mend, it is best to use the pattern to make a good impression and then place the casting in the impression left by the pattern. Now place the iron frame, small part down, so the defect will be in the center of it. Place two small pop gates so they will occupy opposite edges of the defect; lean their upper ends outward so that if their lower ends were together they would form a V. Fill the frame with sand, tucking it carefully so as not to disturb the gates, but firm enough so as it can be handled without danger of its collapsing. Draw more sand around the outside of the frame and tuck it firmly, this to serve as a guide to draw and return the frame by. Take out the gate sticks, lift out the frame with its sand as you would a cope, shave off a little sand at the defect to make it conform to the outline of the casting, and see that the gates and defect are free from sand. Return the frame to its place, and it is ready to pour.

When tucking the sand into the frame build it up about ⅛ inch higher than the top of the frame so the channel which is to carry off the overflow iron can do so without the iron coming in contact with the frame. It is necessary to have one of the gates a little higher than the other to insure an overflow while pouring. Make a little pig bed to catch the overflow iron, first making a channel from the lowest gate.

The hotter the iron the better and the less will be required, so one should always make it a point to have a hot ladle and to catch when the iron is hottest. If the iron is as hot as is usually melted in stove foundries a few pounds will suffice to make a small mend. Pour it in, of course, at the highest gate, and to be a success the iron must flow through and out at the low gate. We have our gates on the cope or least particular side of the casting; when they are knocked off it will leave a small lump, which can be easily and quickly ground off on the emery wheel if necessary. If the job has been well and carefully done there will be a perfect union of the two irons, and the line of demarcation will be barely discernible on the face, and a rub with a pumice stone ought to erase it entirely.

The difference between this and the prevailing practice is obvious. In the one the first drop of iron fills the hole level with the surface of the casting, and the iron poured on top to do the burning does not come in contact with the edges of the hole, hence a perfect union is a rare thing; still the mend may stick by being fused at one small point, or the hole may be of such shape that the mend will be held in place by a sort of dovetail connection without being fused at any point. In my method it is the last drop of iron poured in that makes the mend; all of the iron poured except this last drop has passed through the little mold, coming in contact as it passed with the edges of the defect, and giving up some of its heat, so that when the last drop is poured in the edges of the defect are in a state of fusion and this drop perforce becomes part of the casting. The same thing is aimed at in both methods, but in the one chance is almost entirely eliminated, while in the other it is courted.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Walton Forstall, writing to the Journal, from Philadelphia, under date of the 14th inst., says:

To the Editors American Gas Light Journal: There is a slight error in your report (second column, page 717, issue of November 14th), of my reply to Mr. Neal's question about our manner of connecting services to mains. I said we used a street tee—that is, a tee with one male thread on the run; this tee is so set that the outlet is parallel with the length of the main. Into this outlet is screwed the male thread of a street elbow, turned so that its open end points at right angles to the length of the main. In that way we get a swing joint without using any of the nipples employed by Mr. Neal. The advantage of the street tee is that it enables us to use a plug to keep the gas from the workmen while the rest of the service is being laid."

Messrs. D. J. Collins and F. H. Shelton have purchased the gas properties and franchises of the Darby (Pa.) Gas Company, which acquiring also includes the right to supply gas in the adjoining districts of Lansdowne, etc. The purchasers propose to rebuild the plant and to largely extend the main system.

About eight months ago the proprietors of the Russell House, Middletown, N.Y., installed an acetylene gas machine for the illuminating of their hostelry. Their experience of eight months with it was enough; they are now taking gas from the mains of the Middletown Gas and Electric Light Company. Superintendent Max reports brisk business, especially in connection with the gas division of the Company's trade.

An explosion occurred in the boiler room of the Richmond (Ky.) Water and Light Company, at 2 A. M. of the 12th inst. The explosion was forceful enough to wreck the connections in the retort house and the condensing room, which entailed the shutting off of the gas supply from the city for three days. At the present time the cause of the ex-

plosion is unknown, though the developments so far point to the fact that it was the designed act of a miscreant.

THE following is the text of an ordinance recently passed by the City Council of Houston, Texas, creating the office of City Gas Inspector:

"Section 1. Be it ordained by the City of Houston that there is hereby established a gas inspector, and said gas inspector shall be the city plumber.

"Sec. 2. That it shall be the duty of said gas inspector, when requested to do so, and upon payment to him of the fee of 50 cents, by the party making the request, which fee shall be paid to the City Treasurer, to see that the meters furnished by the gas company properly measure the gas passing through them.

"Sec. 3. That any person or persons interfering in any manner with the meters or gas supply of any gas light company in the City of Houston, or any person having custody of the gas company's meters or gas supply permitting it to be done without the consent in writing from the gas company, shall be guilty of a misdemeanor and upon conviction shall be fined not less than $10 for each and every offense.

"Sec. 4. It shall be the duty of the Gas Company to put in all service pipe between the gas mains and meters according to the terms of their franchise, and no individual or firm shall be permitted to put in any service pipe between mains and meters without first obtaining the consent in writing from the Gas Company so to do."

MR. JOHN O. RICE, the expert who examined the books of the Bath (Me.) Gas and Electric Company, has reported to the committee appointed by the creditors to institute such examination, that the books were correct to the minutest detail. This report happily disposes of the suggestion that Mr. F. H. Twitchell was at fault in any way over the Company's failure.

THE gas works at Cooperstown, N.Y., have been in charge of Mr. O. R. Butler, since the 1st inst.

MR. W. V. SPINNING has been appointed Manager of the American Gas Company's plant at Peru, Ind.

IN the reorganization of the Norwalk (Conn.) Gas Light Company the executive management named was: President, E. J. Hill; Vice-President, H. G. Runkle; Treasurer, A. M. Young. The proprietors it is said propose to extend the main system to the outlying towns of Westport, New Canaan, etc. Mr. H. A. Darbee will act as Manager, and it is not at all unlikely that Mr. Henry Chasmer will be retained as Secretary. The further probability is that Mr. L. C. Hanford, who has been the Superintendent of the Company since 1869, will continue to act in that position.

THE J. C. Hubinger Company (through its President, Mr. J. C. Hubinger) has applied to the authorities of Council Bluffs, Iowa, for a franchise to operate in that city "a steam heating plant, an electric lighting plant and a gas plant." The applying concern owns and operates the electric lighting and street railway systems of Keokuk, Iowa.

MESSRS. John and George Herget, who have for some time had a controlling interest in the Pekin (Ills.) Electric Light and Power Company, have purchased the property and franchises of the Pekin Gas Light Company.

THE storage sheds of the Springfield (Mass.) Gas Company were seriously damaged by fire early this month. The fire was a particularly hard one to subdue, for in addition to a heavy stock of coal the sheds covered many tar barrels and a goodly quantity of log coverings for steam pipes—the Holly system of steam transmission from a central station is or was maintained in Springfield by the Gas Company.

THE capital stock of the Northwestern Gas Light and Coke Company, of Evanston, Ills., has been increased to $2,000,000, from $500,000. The Company, which is under the control of Messrs. Rufus Dawes and Charles G. Dawes—the latter is the Comptroller of the United States currency—proposes to extend its main system to the outlying districts. The first important move in that direction will be towards the prosperous settlement of Winnetka.

AT the annual meeting of the Rahway (N. J.) Gas Company the Directors chosen were: John Kean, Julian Kean, Hamilton F. Kean, Francis Engel, F. A. Price, James McGuire, James Vanderhous, H. Simmons and William Mershon.

MENTIONING Mr. John Kean reminds us of the fact that all portents seem to indicate that in due time his title will be United States Senator Kean. He is a credit to the gas industry; he will be a credit to the upper branch of Congress.

THIS is the latest schedule of gas rates proposed for Salt Lake City, Utah—it is announced to become operative November 30th: "Gas used for illumination or heat, per 1,000 cubic feet, $1.10; subject to a discount of 10 cents per 1,000 cubic feet, if bills are paid on or before the 8th day of succeeding month in which gas is consumed. Minimum charge per month, $1."

MR. GEORGE W. STARR, receiver for the Yale Gas Stove Company, of New Haven, Conn., in submitting his accounts and asking for discharge, reported that during his incumbency of the trust he had received $1,465, all of which was needed to pay expenses and court fees in settling up the Company's affairs. The creditors are evidently not in the settlement.

THE people of Bath, Me., are loud in their complaint over the rates charged for gas in that city. Nor is their objection groundless, when it is remembered that the charge per 1,000 is well in excess of an average of $2.50.

MR. WILLIAM JONES, who had been in the employment of the Waltham (Mass.) Gas Company since 1868, died at his home in that city the afternoon of November 9th. He was in his 58th year.

THE United Gas Improvement Company will construct a new storage holder, at Avenue B and West 43d street, Bayonne district of Jersey City, for the better supply of gas in the territory served by the Bayonne and Greenville Gas Light Company. The holder is to be equal to retaining something over 300,000 cubic feet.

A CORRESPONDENT at Stockton, Cal., forwards the following, under date of the 12th inst.: "Attendant upon its moving into its new and handsome offices, No. 316 East Main street, the Stockton Gas and Electric Company has inaugurated a cut of 20 per cent. on electric light and power. The new quarters are elegantly lighted and furnished; 100 incandescent electric lights and 75 Welsbach burners furnish light sufficient to make the office a show place of Stockton. The windows are arranged to display the latest novelties in shades, burners and so on, and the floor room of the office, particularly towards the front, is absolutely covered with specimen gas ranges, radiators and other gas using appliances. The Company is arranging for a cooking school course, the demonstrator to be a well-known expert in the line indicated. The Company is now supplying electric currents continuously—that is, during all of the 24 hours in a day."

MUCH main extension is projected by the proprietors of the White Plains (N. Y.) Lighting Company. They will also replace much of the present small diameter pipe with sizes equal to the demands of the several districts heretofore inadequately supplied.

TAE Pacific Lighting Company, of San Francisco, Cal., has declared a dividend of 40 cents per share, payable on demand; the regular monthly dividend (50 cents per share) by the Pacific Gas Improvement Company, of San Francisco, has been payable since the 10th inst.; and the Central Gas Light Company's dividend (also disbursed in San Francisco) of $1 per share is ready for distribution.

IT is reported that J. D. Witter, of Grand Rapids, Mich., and G. W. Paulus, of Chicago, have made a fair bid for the gas and electric lighting systems of the Stevens Point (Wis.) Lighting Company. The properties are now in the hands of a receiver.

THE speculators who (with utter disregard of that which their unfortunate action may cause to others in the gas industry) are contesting for the control of the gas supply of Trenton, N. J., are pointing with pride to the fact that they are selling gas at 25 cents per 1,000 cubic feet. We, however, must remark with sorrow that there must be a good, round, net loss on each 1,000 cubic feet of gas sold in Trenton at anything under $1.

THE new proprietors of the Pulaski Gas Light Company, of Little Rock, Ark., have rented commodious offices in the Whipple Building, Fourth and Scott streets. Mr. Durand Whipple, Secretary and Manager of the Company, has been empowered by the Company to make many important changes in its practices.

A FEATURE in the "Street Fair" of Evansville, Ind., was the illumination scheme maintained by the Evansville Gas and Electric Light Company. Manager Wilkiemeyer planned the display, and it was in every sense successful.

THERE is trouble in the camp over control in the Jefferson City Gas Light Company, of New Orleans, La., the charter of which expires by limitation next March. The principal owner of the corporation is the New Orleans Gas Light Company.

"OBSERVER" forwards the following, under date of the 16th inst.: "The first of the so-called subway explosion cases reached trial in Boston, before the Superior Court, last week. It will be recalled that, in the construction of the subway in Boston, a space was left between the barrel of the subway and the planked-over surface of the street, in which an explosive mixture accumulated, that finally exploded, with disastrous results both to life and property. Many suits are pending, and the first—that of Wolf Koplan, a bootblack, for $10,000—will be a test case. He charges that the Metropolitan Construction Company negligently allowed to exist for a long time a cavity in the street, in which gas was likely to and did collect; and it allowed gas to collect there. That the Gas Company permitted its gas pipes to get out of repair, and negligently allowed gas to escape and fill the cavity. That the Edison Company, knowing the dangerous condition of things, permitted its underground wires to get out of repair. That the electric railroad, knowing of this dangerous condition, negligently ran an electric car, transmitting an electric spark over the cavity; and by reason of all this negligence the explosion occurred. Mr. D. L. Whipple represents the plaintiff, while the various defendants are represented by an array of talent seldom seen together. Undoubtedly the Gas Company will have to bear the brunt of the case, for it is not only made subject to the joint counts with the others, but the plaintiff alleges, in his count against the Gas Company, that it failed in its duty to carefully inspect and secure its pipes, that the pipes became insecure and leaked, and, as the Company did not discover and repair the same, in time the explosion occurred. Many witnesses are being called to show that gas leaks had been of frequent occurrence at the point where the explosion happened, and that many complaints had been made, even up to the moment of the explosion. The case will be on trial for considerable time, and many interesting points will undoubtedly be developed before the whole matter is placed in the hands of the jury."

THE New York *Press*, of the 10th inst., said: "Application was made by Attorney General Hancock yesterday, in the Supreme Court, for permission to bring an action to annul the charter of the City Gas Company. It was granted. The ground on which it was asked was that the Company had forfeited its charter, which was granted it 33 years ago, by not availing itself of its provisions. It was also asserted that the charter should be forfeited because the Company had suspended operations for a period of 12 months, which was a reason for the dissolution of the corporation. The Company never exercised its franchise, but since the Greater New York Charter was passed attempts have been made to dispose of the franchise, which permits the Company to lay its mains in the city of New York without payment. The charter is unlimited as to time, and would confer benefits on the corporation which the city charter prohibits. It was contended that if the Company were allowed to exercise its franchise, the very fact that it would not be hampered by the restrictions imposed upon corporations by the new charter, would enable it to supply gas at far lower rates than those now charged by the various gas companies. It was also asserted that the proceedings by the Attorney General were the outcome of the instigation of the existing gas companies. The Attorney General averred that the rights of the City Gas Company had lapsed, and that the mains which it was empowered to lay under its franchise had already been laid by other companies, owing to its neglect. It was further said that it would be impossible to lay more mains in most of the city streets on account of the number of pipes and tubes now laid in them."

THE United Gas Improvement Company's handsome branch offices, 1706 North Broad street, Philadelphia, are much appreciated by the gas users of the Quaker City.

Anthracite Coal in Peru.

William Griffith, Mining Engineer, of Scranton, Pa., recently read a paper before the Mining and Metallurgical Section of the Franklin Institute of Philadelphia, on the subject of "Anthracite Coal in Peru, South America." After descriptive remarks as to the climate, topography and general geology of the Andes Mountains, Mr. Griffith said in part:

There are two principal coal fields, about 100 miles apart, visited by him, in Northern Peru. The first, located in the Department of Cajamarca, consists of two large coal basins, each probably 20 or 30 miles long, extending side by side, northwest and southeast, separated by a prominent anticlinal. The northern of these two basins dips into the mountains and occupies the region near the junction of the Llaucon and Marinon Rivers, which flow into the Amazon River. The other basin occupies the mountains of the continental divide of the Andes, between the towns of Hualgayoc and Chota, and is overlaid by an immense thickness of limestone of a very recent age. The western outcrops are on the Pacific slope, where future explorations may discover the coal. The coal beds of this field are found in a great thickness of Jurassic sandstone—the bottom part only of which was examined—and contain several beds of anthracite coal from 3 to 7 feet thick. These seams dip about 25° and have a strike northwest and southeast. Their quality, both as to the interstratified refuse and chemical analysis, is equal to the average of Pennsylvania anthracite; and if the beds are as continuous as is usual with coal seams there exists here an enormous body of coal which can be mined by drift or tunnel, above water level, for years to come, as the outcropping coal measures are visible flanking the sides of the valleys of the streams for long distances. The field would be practically inexhaustible. It is about 300 miles from the navigable waters of the Amazon and 150 miles from the Pacific.

The other field is located on the Chicama river, in the Department of Libertad, about 30 miles southwestward of the town of Huamachuco. The coal here occurs in the same sort of sandstone, but at a dip of about 70° or 80°. The principal bed is a large one, 10 to 20 feet in thickness, the outcrop of which is opened at various points, and may be readily traced for miles. The bed is on the Pacific Slope, 100 miles from the ocean.

The coal beds are remarkably free from impurities, and the quality of the coal is proved by analysis to excel that of Pennsylvania. Smaller seams are also visible above and below the mammoth bed of the region. The outcrops of the coal-bearing rocks in this field may be readily traced for 15 to 30 miles with few interruptions. The quantity of coal which could be mined is very large, and much of it may be secured above water level.

The mountainous country in the region of these coal fields is elevated 7,000 to 13,000 feet, and is wild and sparsely inhabited, but is susceptible in places to extreme cultivation along certain lines, and remarkable development would undoubtedly follow the introduction of modern means of communication and transportation.

The Market for Gas Securities.

The market for city gas shares during the week was irregular, the feature being sharp declines in the values of Consolidated and Amsterdams. The former sold down to 183, after which a firmer feeling was developed, the opening trade to-day (Friday) being made at 185¼. New Amsterdam common is 27¼ to 27½, and the preferred is 65 to 65¾. Standards are materially stronger, and quite some inquiry is on for Mutual. Meanwhile the contest for business is waxing warmer, but in the eyes of the ordinary observer it has not lost any of its ridiculousness.

The real feature of the local market, however, is Brooklyn Union, which sold above 131. Of course, at that figure it carries the dividend recently declared. The executive management named by the Directors for the ensuing year is: President, Jas. Jourdan; Vice-President, H. H. Rogers; Treasurer, Elverton R. Chapman; Assistant Treasurer, Chas. H. Stoddard; Secretary, Edwin Ludlam; Assistant Secretary, W. K. Rossiter; Executive Committee, J. Jourdan, H. H. Rogers, Wm. Rockefeller, John G. Moore and E. G. Leggett.

Peoples, of Chicago, is 108 to 108¼, and 210 is freely bid for shares in the Jersey City Company. Washington (D. C.) gas is 255 bid. The proprietors of the Hackensack (N. J.) Company have obtained control of the Bergen County Gas Light Company, of Englewood, N. J., with a view to consolidating their mutual interests. The American Gas Company has declared a dividend of 3 per cent., payable on and after the 1st prox. Bay State is 4¼ to 5. Lacledes are in better demand, as is Baltimore Consolidated. This latter stock is being steadily absorbed by a very strong interest. Syracuse gas is notably weaker, and the Buffalo issues are also below the figures of last week. New Haven stock is booming, and recent trading in Hartford shares was done at record prices for it.

Gas Stocks.

Quotations by Frederic B. Cochran & Co., Brokers and Dealers in Gas Stocks.

20 and 22 Broad Street, New York City.

Nov. 21.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$37,730,000	100	184¾	185⅜
Cental Union, Bonds, 5's	3,000,000	1,000	101	101½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	305	315
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	27¼	27½
Preferred	10,000,000	100	65	65¾
Bonds, 5's	11,000,000	1,000	101¼	102
Northern Union, Bonds, 5's.	1,250,000	1,000	94½	95½
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000		107½	108½
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	
Standard	5,000,000	100	133	139
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	130	131
" " Bonds (5's)	15 000,000	1,000	115	116
Bay State	50,000,000	50	4½	5
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works...	450,000	100	..	..
" 1st Mtg. 5's	450,000	1,000	..	..
Boston United Gas Co,—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	..	80
Buffalo City Gas Co.	5,500,000	100	18	18½
" " Bonds, 5's	5,250,000	1,000	93	93½
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	89	91
1st Mortgage	1,207,000	1,000	101	103½
Consumers, Jersey City	2,000,000	100	80	..
" Bonds	600,090	1,000	102	104
Cincinnati G. & C. Co.	8,500,000	100	202½	203
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	65	66
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	..
Consolidated Gas Co. of N.J.	1,000,000	100	16	21
" Con. Mtg. 5's	380,000	1,000	75	80
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,560,000	50	65	65½
" Prior Lien 5's	4,546,000	1,000	94¼	94½
Detroit Gas Co., 5's	423,000	1,000	..	..
" Inc. 5's	31,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wa	2,000,000	..	75	80
" Bonds	2,000,000	..	88	
Grand Rapids Gas Lt. Co..	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	.
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	115	125
" Bonds, 6's	2 650,000	..	106	107
Jackson Gas Co	250,000	50	..	..
" 1st Mtg. 5's	250,000	1,000	..	..
Jersey City	750,000	20	210	..
Lafayette Gas Co., Ind.	1,000,000	100	78	83
Bonds	1,000,000	1,000	90	91
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	49	49½
Preferred	2,500,000	100	93	94
Bonds	10,000,000	1,000	105½	106
Madison Gas & Elec. Co.	400,000	100	..	..
" 1st Mtg. 6's	350,000	1,000	..	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	252	..
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	53½	55
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	108	108¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	240	250
Rochester Gas & Elec. Co..	2,150,000	50	52	..
Preferred	2,150,000	50	103	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	88½	89
St. Paul Gas Light Co	1,500,000	100	50	52
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co	1,000,000	100	..	..
" 1st Mtg. 5's	750,000	1,000	..	..
Syracuse, N. Y.	1,750,000	100	13	15
Bonds	1,612 000	1,000	85	89
Washington, D. C	2,000,000	20	250	..
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	85¼	86
Bonds, 5's	3,330,500	.	101¾	102½
Wilmington, Del.	550,000		204	206

Advertisers' Index.

GAS ENGINEERS.

	Page
Wm. Henry White, New York City	775
Fred. Bredel, Milwaukee, Wis.	762
Geo. R. Rowland, New York City	775
The Western Gas Construction Co., Fort Wayne, Ind.	764
Humphreys & Glasgow, New York City	768
American Gas Co., Phila., Pa.	762
David Leavitt Hough, New York City	777
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	775
Baxter & Lynn, Detroit, Mich.	759

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	773
United Gas Improvement Co., Phila., Pa.	767
Burdett Loomis, Hartford, Conn.	774
National Gas and Water Co., Chicago, Ills.	769
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	775
The Western Gas Construction Co., Fort Wayne, Ind.	764
Humphreys & Glasgow, New York City	768
Chas. Hornbostel, New York City	758

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City	776
Continental Iron Works, Brooklyn, N. Y.	174
Deily & Fowler, Phila., Pa.	776
Kerr Murray Mfg. Co., Fort Wayne, Ind	772
Stacey Mfg. Co., Cincinnati, Ohio.	775
Bartlett, Hayward & Co., Baltimore, Md.	773
Davis and Farnum Mfg. Co., Waltham, Mass.	772
R. D. Wood & Co., Phila., Pa.	774
Isbell-Porter Company, New York City	774
Fred. Bredel, Milwaukee, Wis.	762
United Gas Improvement Co., Phila., Pa.	767
Berlin Iron Bridge Co., East Berlin, Conn.	761
National Gas and Water Co., Chicago, Ills.	769
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	775
The Western Gas Construction Co., Fort Wayne, Ind.	764
Humphreys & Glasgow, New York City	768
Gas Engineering Co., Pittsburgh, Pa.	772
American Gas Co., Phila., Pa.	762
Logan Iron Works, Brooklyn, N. Y.	776
Riter-Conley Mfg. Co., Pittsburgh, Pa.	768
Baxter & Lynn, Detroit, Mich.	759

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City	775
R. D. Wood & Co., Phila., Pa.	774
James R. Floyd's Sons, New York City	776
Continental Iron Works, Brooklyn, N. Y.	774
Gas Engineering Co., Pittsburgh, Pa.	772
Logan Iron Works, Brooklyn, N. Y.	776
Riter-Conley Mfg. Co., Pittsburgh, Pa.	768

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons, New York City	775
R. D. Wood & Co., Phila., Pa.	774

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich.	768
G. Shepard Page's Sons, New York City	775
Gas Engineering Co., Pittsburgh, Pa.	772

GAS METERS.

John J. Griffin & Co., Phila., Pa.	744
American Meter Co., New York and Philadelphia	779
Helme & McIlhenny, Phila., Pa.	779
D. McDonald & Co., Albany, N.Y.	777
Nathaniel Tufts Meter Co., Boston, Mass.	778
Maryland Meter and Mfg. Co., Baltimore, Md.	778
Metric Metal Co., Erie, Pa	778
Keystone Meter Co., Royersford, Pa.	778
Detroit Meter Company, Detroit, Mich.	779

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia	779
John J. Griffin & Co., Phila., Pa.	744
D. McDonald & Co., Albany, N. Y.	777
Helme & McIlhenny, Phila., Pa.	779

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio	777
M. J. Drummond & Co., New York City	777
R. D. Wood & Co., Phila., Pa.	774
Warren Foundry and Machine Co., New York City	777
Donaldson Iron Co., Emaus, Pa.	777
Utica Pipe Foundry Co., Utica, N. Y.	777

PIPE CUTTERS.

The Anderson Pipe Cutter Co., East Boston, Mass.	761

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N. Y. City	758

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y.	769

GAS COALS.

Penn Gas Coal Co., Phila., Pa.	771
Perkins & Co., New York City	770
Despard Gas Coal Co., Baltimore, Md.	771
Westmoreland Coal Co., Phila., Pa.	771
Berwind-White Coal Mining Co., New York and Phila.	770
W. D. Althouse & Co., Phila., Pa.	771

CANNEL COALS.

Perkins & Co., New York City	770
W. D. Althouse & Co., Phila., Pa.	771

GAS ENRICHERS.

Standard Oil Co., New York City	771
The Sun Oil Co., Pittsburgh, Pa.	771

COKE CRUSHER.

C. M. Keller, Columbus, Ind.	771

GAS GAUGES.

The Bristol Co., Waterbury, Conn.	759

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City	769
Isbell-Porter Co., New York City	774
R. D. Wood & Co., Phila., Pa.	774
Wm M. Crane Co., New York City	759

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N.Y.	760

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J.	760
B. Kreischer & Sons, New York City	760
Adam Weber, New York City	760
Laclede Firebrick Mfg. Co., St. Louis, Mo.	760
Cyrus Borgner, Phila., Pa.	760
James Gardner, Jr., Pittsburgh, Pa.	760
Henry Maurer & Son, New York City	760
Baltimore Retort and Firebrick Co., Baltimore, Md.	760
Parker-Russell Mining and Mfg. Co., St. Louis, Mo.	760
Brooklyn Firebrick Works, Brooklyn, N. Y.	760

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md.	773
Fred. Bredel, Milwaukee, Wis.	762
J. H. Gautier & Co., Jersey City, N. J.	760
Parker-Russell Mining and Mfg. Co., St. Louis, Mo.	760
Adam Weber New York City	760

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City	774
Continental Iron Works, Brooklyn, N.Y.	774
G. Shepard Page's Sons, New York City	775
Logan Iron Works, Brooklyn, N. Y.	776
R. D. Wood & Co., Phila., Pa.	774

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa.	766
Victor Incandescent Company, New York City	750

MICA GOODS.

The Mica Mfg. Co., New York City	759

BURNERS.

C. A. Gefrorer, Phila., Pa.	774
Wm. M. Crane Co., New York City.	759

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 759

STREET LAMPS.

Welsbach Street Lighting Co., New York and Phila..... 768

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 769
Greenpoint Chemical Works, Brooklyn, N.Y..... 769
Gas Purification and Chemical Co., Ltd., London..... 769

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind..... 768
Isbell-Porter Company, New York City..... 774
Connelly Iron Sponge and Governor Co., New York City 769

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y. 764
Chapman Valve Manufacturing Co., Boston, Mass..... 764
R. D. Wood & Co., Phila., Pa..... 774
Continental Iron Works, Brooklyn, N. Y..... 774
The P. H. & F. M. Roots Co., Connersville, Ind..... 768
Isbell-Porter Co., New York City..... 774
The Western Gas Construction Co., Fort Wayne Ind.... 764

ELECTRICAL APPARATUS.

Wm. Henry White, New York City 775

GAS ENGINES.

Otto Gas Engine Works, Phila., Pa..... 780
Backus Water Motor Co., Newark, N. J..... 758

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City..... 761

PURIFIER SCREENS.

John Cabot, New York City..... 759

GAS STOVES.

American Meter Co., New York and Philadelphia 765
Maryland Meter and Manufacturing Co., Baltimore, Md. 778
Keystone Meter Co., Royersford, Pa..... 778
Wm. M. Crane Co., New York City..... 759

GASHOLDER TANKS.

J P. Whittier, Brooklyn, N. Y 764

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md..... 773
Continental Iron Works, Brooklyn, N. Y..... 774
Deily & Fowler, Philadelphia, Pa..... 776
Davis & Farnum Mfg. Co., Waltham, Mass..... 772
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 772
Stacey Mfg. Co., Cincinnati, Ohio..... 775
R. D. Wood & Co., Philadelphia, Pa..... 774
Logan Iron Works, Brooklyn, N. Y..... 776
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 768

DIVIDEND NOTICE.

OFFICE OF THE AMERICAN GAS COMPANY,
222 S. THIRD ST., Phila., Pa., Nov 16, 1898.

The Board of Directors of The American Gas Company have this day declared a semi-annual dividend of 3 per cent., or $3 per share, on the outstanding Capital Stock of the Company, payable on and after Dec. 1, 1898.

1224-1 MORRIS W. STROUD, Treas.

WANTED,

A Good All-round Man as Superintendent.

Must be practical and competent to take charge of everything connected with a coal gas plant in a town of 8,000 inhabitants. Address, giving age, experience and salary expected, "F.," care this Journal.

For Sale, Cheap,

A No. 7 Roots Exhauster.

Newly repaired and not since used. Address

THE ELIZABETHTOWN GAS LIGHT CO,
1224-4t Elizabeth, N. J.

WANTED,

A Second-Hand Gas Exhauster.

Five thousand to ten thousand cubic feet capacity per hour. In good condition.

1224-tf Address "F. H.," care this Journal.

Backus Heaters at One-Third Cost Price.

We have a stock of various sizes and styles of Backus Gas Heaters, in first-class condition, which we offer at *one-third cost price.*

THE COLUMBUS GAS COMPANY.
1218tf Columbus, Ohio.

Position Wanted

As Superintendent of Gas Works.

Twenty years' experience in manufacturing, with reference.

1222-4 Address "G.," care this Journal.

Position Wanted.

Thoroughly competent man wishes position as Superintendent or Manager of a gas or gas and electric plant.

Address "S. E. R.,"
1220-tf care this Journal.

DR. MOSS is open to engage with responsible firm as representative, or charge of works. Will advise on all difficulties met with in the manufacture and distribution of Coal, Oil or Water Gas. Terms reasonable.

Address
DR. MOSS,
1178-tf Care this Journal.

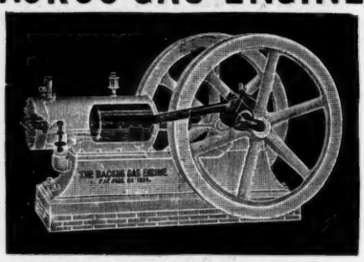
FOR SALE,

300 Meters of Various Sizes,

Owing to the abandonment of the manufacture of artificial gas and the substitution of natural gas. All in serviceable condition. Prices very low.

C. H. WELCH, Manager,
1223-2 Athens, Ohio.

BACKUS GAS ENGINES.



GUARANTEED SUPERIOR IN EVERY WAY. BUILT ON HONOR.

Agts. { **Chicago Water Motor & Fan Co.,** 101 Lake St., Chicago.
{ **Michell & Co.,** - - 154 Congress Street, Boston, Mass.
Home Office, **Backus Water Motor Co.,** Newark, N. J.
Send for Catalogue.

For Sale.

A Small Gas and Electric Light Plant,

in a Southern city of 3,800 inhabitants.

Address FORT WAYNE ELECTRIC CORPORATION,
1097-tf Fort Wayne, Ind.

Utilize Your Gas Liquor.

NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator.

Not Expensive. Write to

STROH & OSIUS, Pat'ees, or
Mich. Ammonia Works. Detroit, Mich.

WATER GAS

FREED from SULPHUR

—IN THE—

GENERATOR.

By conducting the air, on which the combustion in a generator is sustained, into intimate contact with a compound of 35 parts (by weight) of peroxide of manganese, 5 to 10 of chloride of sodium and 60 of sulphuric acid (U. S. Pat., No. 423,868), the air is enriched with chlorinated nascent oxygen, which, by its great affinity for sulphur, combines with and oxidizes the sulphur in the coal and transforms it in such a manner, and to the effect, that the carbon oxide and the water gas, resulting from the decomposition of the steam passed throuhg the treated incandescent coal in the generator, contain no sulphurous acid gas, nor any sulphur compounds, and that the purification by iron oxides is obviated and consequently the occurring of iron carbonyl. By this process the combustion is perfected, and at least 20 per cent. of coal saved. The use of inferior coal is made less objectionable and clinkering is overcome in any coal. The heat is whiter and raised to about 200° F. above the ordinary heat obtainable. Wrought iron fuses in it. For a test in the laboratory fill the compound into a Wulf bottle, one-eighth full, and blow air on or through. The expense for chemicals, needing renewal about every 10 hours, is equivalent to not exceeding five cents per ton of coal. For further information address

CHAS. HORNBOSTEL,
102 FULTON STREET, ROOM 401, NEW YORK CITY.

GOODMAN

GAS MAIN STOPPER

For Shutting Off Gas in Mains Temporarily during Alterations or Repairs.

For Particulars Address

SAFETY GAS MAIN STOPPER COMPANY,
211 East 116th Street, New York.

BRAY'S Patent GAS BURNERS

Are universally used and recommended by leading Gas Companies of the world.

Every Burner stamped with name and Trade Mark. Take no imitations.

Made for high and low pressure. Send for description and prices, also for

ACETYLENE BURNERS.

We are Sole Agents for the United States.

WILLIAM M. CRANE COMPANY,

Nos. 1181 and 1188 Broadway, New York City.

BRAY SPECIAL.

BRAY BURNERS

ARE

The STANDARD Burners of the World

For HIGH and LOW Pressure.

LAVA TIP.

SLIT-UNION. SPECIAL.

WHY NOT USE THEM LIBERALLY?

It Pays to have the Best Always. . . .
Consumers will be Happy.
Your Burdens LIGHTENED.

We can Ship You 1 Gross or 10,000.

UNION-JET. SPECIAL.

WILLIAM M. CRANE COMPANY,

Sole Agents for United States, Makers of Gas Appliances,

Main Office, 1131, 1133 BROADWAY, - - NEW YORK.

BAXTER & LYNN.

GAS ENGINEERING AND CONSTRUCTION.

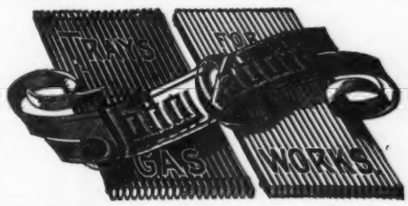
Examination Made of Gas Properties.
Values Ascertained, and Advice as to Management.

OFFICE: WAYNE COUNTY BANK BUILDING, DETROIT, MICH.

Special Trays for Iron Sponge or Oxide of Iron,

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable, Most Easily Repaired.



553-557 West Thirty-third Street, New York.

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET.

Send for Circulars.

BRISTOL'S RECORDING

PRESSURE GAUGE.

For continuous records of **Street Gas Pressure**

Simple in Construction, Accurate in Operation Low in Price.

Fully Guaranteed. Send for Circulars.

The Bristol Co.,

Waterbury, Conn.

THE MACHINE THAT KNITS INCANDESCENT GAS LIGHT **Mantle Fabric** AUTOMATICALLY IS MADE BY **LAMB MFG. CO.** CHICOPEE FALLS, MASS.

CUT AND PRICES FURNISHED ON APPLICATION.

AMERICAN VICTORY.

Photometric Test Results as follows:

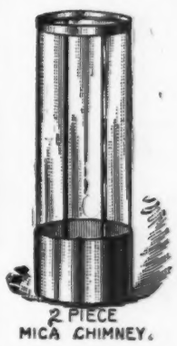
	Candle power per ft. of Gas
STEWARD'S Special Burner,	4.046
Best Imported " "	3.477

Write for Particulars.

The D. M. Steward Mfg. Co.,

CHATTANOOGA, Tenn. AND 107 CHAMBERS ST., New York City.

Our Mica Chimneys



Etched Chimneys to Order.

For Welsbach Lights

ARE THE

BEST IN THE WORLD.

Get Catalog and Discounts.

The MICA MFG. CO

Micasmiths,

88 Fulton Street, N. Y. City.

"VICTOR" Regenerative Incandescent Gas Lamps and Mantles

No Air Shutter, therefore no Smoked Mantles. Hot Air taken from Chimney. Impossible to snap back. "VICTOR" MANTLES are the strongest and most durable on the Market.

Address for full particulars and Illustrated Catalogue,

VICTOR INCANDESCENT CO., 171-173 6th Ave., N.Y. City.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D. ABERNETHY. Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

E. D. WHITE, President. A. H. GUTKES, Vice-President. H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of CAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Exclusive Agents for

The Mitchell Half-Depth Regenerative Furnace.

This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

Proprietors of the Coze System of Inclined Retorts.

Office: 901 Pine St., **St. Louis, Mo.**

ESTABLISHED IN 1845.

B. KREISCHER & SONS,

Office, 119 E. 23d St., New York.

Gas Retorts,

TILES, FIRE BRICK.

AND EVERYTHING IN THE FIRE CLAY LINE.

Adam Weber,

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces

And Standard Fire Brick and Gas Retorts.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Hamilton Building, Fifth Avenue
PITTSBURGH, PA. P. O. Box 373

Successor to WILLIAM GARDNER & SON

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouth-pieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

PRICE LIST.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 300 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD & CO.,

N. 3d & Prospect Avs., Mt. Vernon, N.Y.

Western Agent, H. T. GEROULD, Centralia, Ills.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec'y
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE
RETORT & FIRE BRICK CO.

MANUFACTORY AT
LOCUST POINT BALTIMORE MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 16x16x2.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

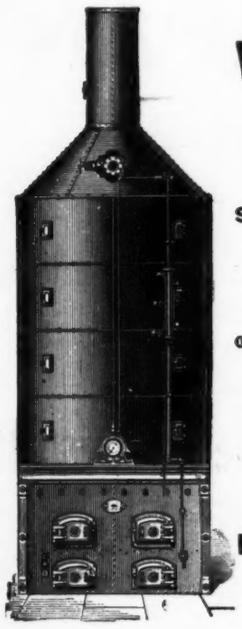
Sole Agents for New England States.

PRACTICAL PHOTOMETRY.

A Guide to the Study of the Measurement of Light.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations, Price, $3.00 A. M. CALLENDER & CO., 32 Pine Street, N. Y. City



HIGH-PRESSURE
WATER-TUBE BOILERS.

THE HAZELTON OR PORCUPINE BOILER
IN 50 to 500 H. P. UNITS.

SINGLE BOILERS OR COMPACT BATTERIES.
GREAT SAVING OF FLOOR SPACE
AND FUEL.

LARGE-SIZE BOILERS IN STOCK.

Our new book, "The Generation of Power," will be mailed on request.

THE HAZELTON BOILER CO.
Sole Proprietors and Manufacturers.
ALSO BUILDERS OF
Stacks, Tanks and Miscellaneous Metal Work.
GENERAL OFFICE:
No. 716 E. 13th ST., New York, U.S.A.

Cable Address, "Paila," New York.
Telephone Call, 1229-18th Street, New York.

BRIDGES BERLIN BUILDINGS
OUR CATALOGUE
OF THREE HUNDRED PAGES ILLUSTRATING AND DESCRIBING A LARGE NUMBER OF
BRIDGES
BUILDINGS
AND ROOFS
Designed and Built by us
Is now ready and will be sent on application.
THE BERLIN IRON BRIDGE CO.
EAST BERLIN, CONN.

POOLE ON FUELS.
THE CALORIFIC POWER OF FUELS.
By HERMAN POOLE, F.C.S.
Price, $3. For Sale by
A. M. CALLENDER & CO., 32 PINE ST., N.Y. CITY.

THE ANDERSON Patent Cutter Carrying Link
Made in all sizes.

Will cut from 2 in. to 24 in.
Pipe Cutting Tool

For Cutting Cast, Wrought Iron, Gas & Water Pipes.
THE ANDERSON PIPE CUTTER COMPANY, Manufacturers,
163 Liverpool st., E. Boston, Mass
N. Y. Office, 135 Greenwich St
C. H. TUCKER, JR., Manager.
WALDO BROS.,
102 Milk Street, Boston, Mass

The Gas Engineer's Laboratory Handbook.
BY JOHN HORNBY, F.I.C. Price, $2.50.
A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY.

Gas Investments in California.

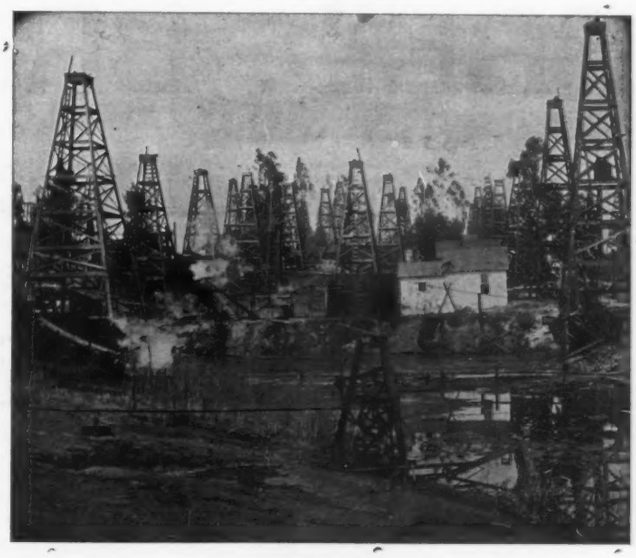
Nowhere else on this continent does such opportunity exist for profitable gas investment as on the Pacific Coast, since the perfection of the new LOWE Process for using the heavy crude California oils (of which there is an unlimited supply) without the use of any other fuels. Seven years' test proves the system to be perfect in every respect. Los Angeles alone, in addition to present street mains, has 150 miles of well built up streets without a gas main on them. To occupy this territory, and a large number of other towns now without gas, we have organized a parent company and a number of local companies covering some of the fastest growing cities in the United States.

Now is the time to invest, when the first capital will be able to double itself in a single year. This is also the most delightful residence section in the United States.

We suggest to those desiring gas investments, in large or moderate amounts—with or without active business connections—to come here and investigate; or, what is the next best thing, write us for particulars and prospectus.

The accompanying cut shows the oil wells in the suburbs of Los Angeles from which the Companies under the NEW LOWE GAS PROCESS obtain their supply of oil.

AMERICAN GAS & COKE CO. (T. S. C. Lowe, Manager),
406 Bradbury Building, Los Angeles, California.



THE GAS ENGINEER'S POCKET-BOOK.

By HENRY O'CONNOR.

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

Price, - - $3.50.

A. M. CALLENDER & COMPANY, No. 32 Pine Street, N. Y. City.

AMERICAN GAS COMPANY

Constructors of Coal Gas Apparatus.

KLONNE-BREDEL

Recuperative Furnaces, Washers, Condensers, Purifiers and Purifying Machines, Ammonia Plant, Coke Conveyers, Etc.

Complete Works Erected with Guaranteed Results.

EASTERN AGENTS FOR

FRED. BREDEL'S SYSTEM
COAL GAS PLANTS AND GAS APPARATUS.

P. H. & F. M. ROOTS CO.'S
Exhausters, Blowers, etc.

222 South Third Street, Philadelphia, Pa.

GEORGE G. RAMSDELL, General Manager. **Correspondence Solicited**

FRED. BREDEL, C.E.

Coal and Water Gas Plants,

OWN SYSTEM.

Recuperative Furnaces, Washers, Condensers, Purifiers, Purifying Machines.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas.

COMPLETE GAS WORKS, COKE CONVEYERS, ETC.

No. 118 Farwell Avenue, · · Milwaukee, Wis.

Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa.

ROOTS'

LATEST IMPROVED GAS EXHAUSTER

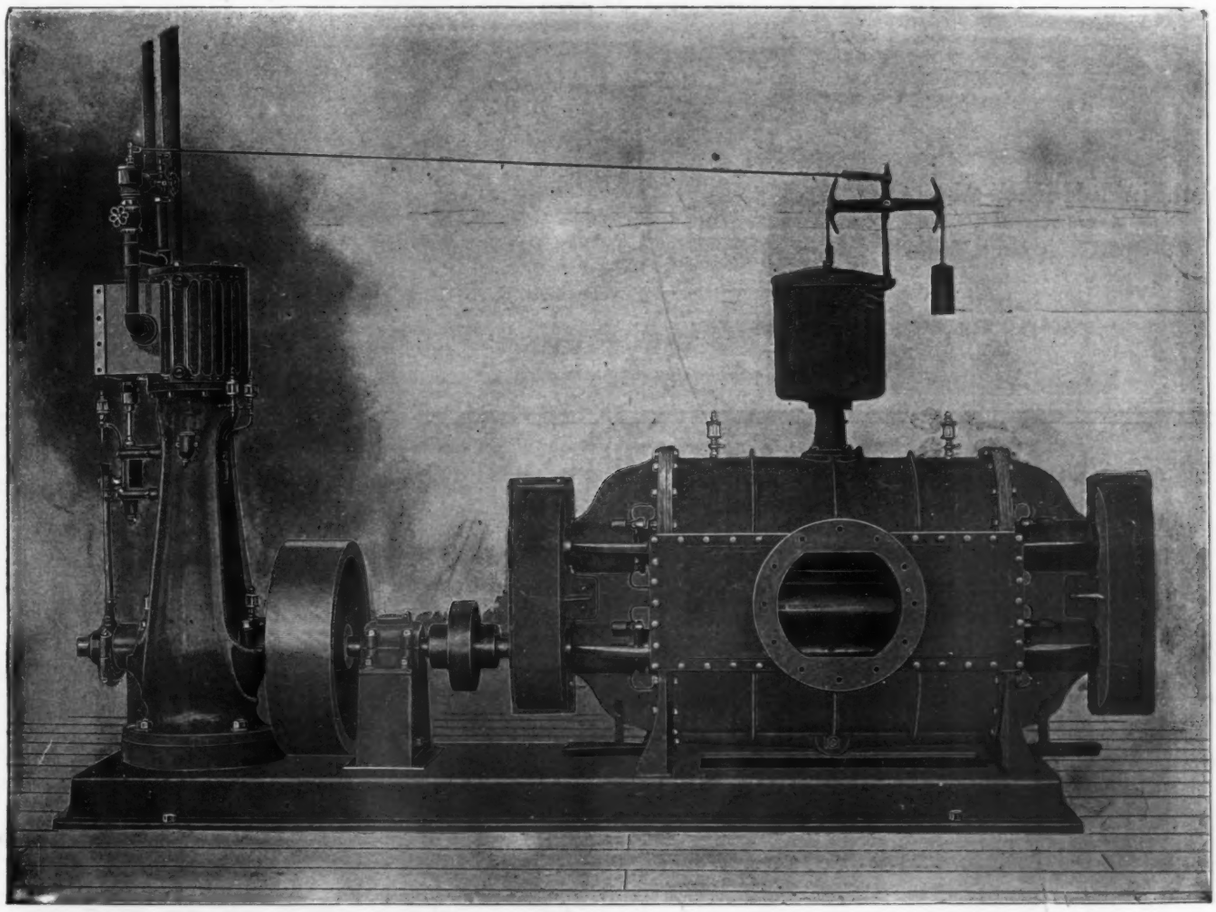
—AND—

NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



INQUIRIES CHEERFULLY ANSWERED. WRITE FOR CATALOGUE.

P. H. & F. M. ROOTS CO.,

Connersville, Ind. 109 Liberty St., New York.

Eastern Office:

American Gas Company,

222 South Third Street, Philadelphia, Pa.

WATER GAS,
COAL GAS,
ANYTHING GAS,
"THE WESTERN GAS."

FORT WAYNE, INDIANA

Lowe Water Gas Apparatus.
Coal Gas Bench Castings.
Purifiers.
Condensers.
Scrubbers.
Exhausters.
Meters.
Governors.
Roofs.
Coal Handling Plants.
Valves and Special Fittings.

WILLIAM HENRY WHITE,
EASTERN AGENT,
32 Pine St., New York.

—THE—
WESTERN GAS CONSTR. CO.,
Fort Wayne, Indiana.

CHAPMAN VALVE MANUFACTURING CO.,

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.

THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

70 Rush St., Near Division Ave., **Brooklyn, N. Y.**

The Gas Engineer's Laboratory Handbook.

BY JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street, N. Y. City

Practical Photometry.

A GUIDE TO THE STUDY OF THE MEASUREMENT OF LIGHT.

By William Joseph Dibdin.

Price, $3.00.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY

BOOKS.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR.

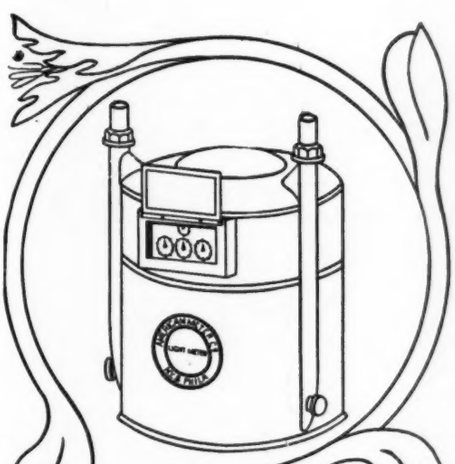
By GEORGE LUNGE. Price $12.50.

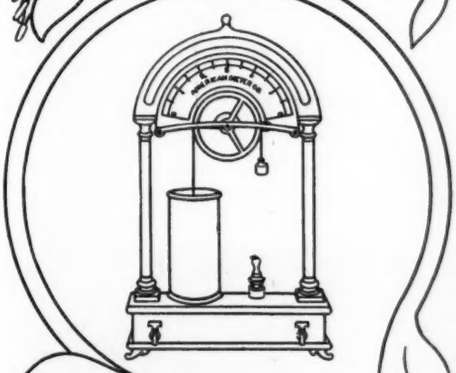
TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS.

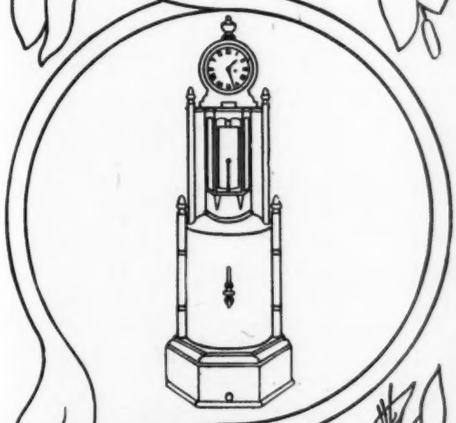
By DAVID A. GRAHAM. 8vo., Cloth. Price $3.

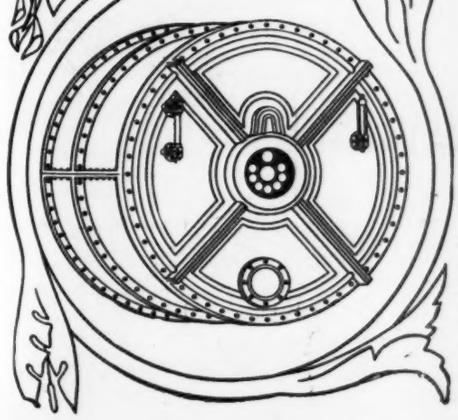
Orders for these books may be sent to this office.

A. M. CALLENDER & CO.,
32 PINE ST., N. Y. CITY









(Copyrighted, 1894, by the AMERICAN METER CO.

AMERICAN METER CO.

ESTABLISHED 1834. INCORPORATED 1863.

NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.

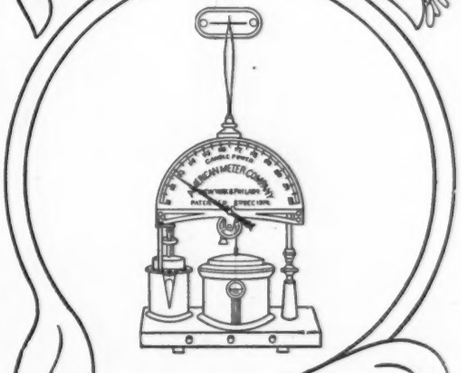
PUBLIC LIGHTING TABLE.

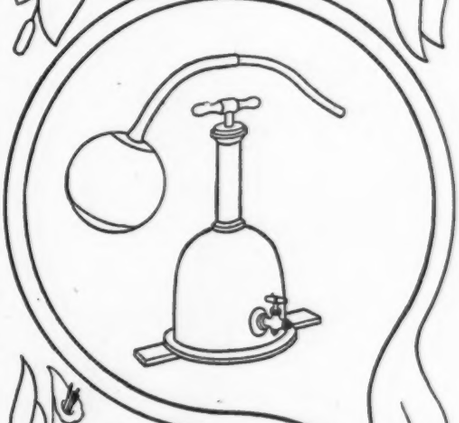
DECEMBER, 1898.

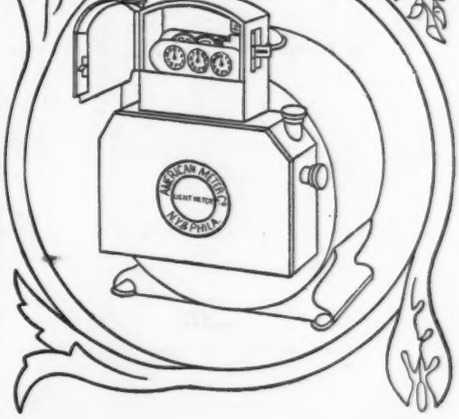
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	5.10 PM	8.40 PM	4.20	6.10
Fri.	2	5.10	9.40	4.20	6.10
Sat.	3	5.10	10.30	4.20	6.15
Sun.	4	5.00	11.30	4.20	6.15
Mon.	5	5.00 LQ	12.30 AM	4.20	6.15
Tue.	6	5.00	1.30	4.20	6.15
Wed.	7	5.00	2.40	4.20	6.15
Thu.	8	5.00	3.40	4.20	6.15
Fri.	9	5.00	4.50	4.20	6.15
Sat.	10	5.00	6.10	4.20	6.20
Sun.	11	5.10	6.10	4.20	6.20
Mon.	12	5.10	6.10	4.20	6.20
Tue.	13	5.10 NM	6.10	4.20	6.20
Wed.	14	5.10	6.10	4.20	6.20
Thu.	15	5.10	6.10	4.30	6.20
Fri.	16	5.10	6.10	4.20	6.20
Sat.	17	5.10	6.10	4.20	6.20
Sun.	18	10.00	6.20	4.20	6.20
Mon.	19	11.10 FQ	6.20	4.20	6.20
Tue.	20	12.10 AM	6.20	4.20	6.20
Wed.	21	1.20	6.20	4.20	6.20
Thu.	22	2.20	6.20	4.20	6.20
Fri.	23	3.30	6.20	4.20	6.20
Sat.	24	4.30	6.20	4.20	6.25
Sun.	25	5.20	6.20	4.20	6.25
Mon.	26	No L.	No L.	4.20	6.25
Tue.	27	No L. FM	No L.	4.20	6.25
Wed.	28	No L.	No L.	4.20	6.25
Thu.	29	5.10 PM	7.30 PM	4.20	6.25
Fri.	30	5.10	8.30	4.20	6.25
Sat.	31	5.10	9.30	4.20	6.25

TOTAL HOURS LIGHTING DURING 1898.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	210.40	January	423.20
February	186.40	February	355.25
March	181.20	March	355.35
April	166.10	April	298.50
May	156.40	May	264.50
June	144.30	June	234.25
July	147.30	July	243.45
August	157.10	August	280.25
September	169.50	September	321.15
October	186.00	October	374.30
November	204.30	November	401.40
December	218.30	December	433.45
Total, yr.	2129.30	Total, yr.	3987.45







Welsbach Commercial Company,

DREXEL BUILDING,

PHILADELPHIA.

WE NOW SELL

THE IMPROVED WELSBACH LIGHT

to all gas companies and first-class dealers in gas appliances.

SEND FOR NEW CATALOGUE AND PRICE LIST.

We are now prepared to furnish our New Combination Pilot Jet By-Pass and Adjustable Bunsen.

Our New Hot Wire Electric Igniter is a great improvement in electric gas lighting. Cannot short circuit. Send for prices and full information.

All imitations of the Welsbach light are infringements of the Welsbach patents, and the public is cautioned against purchasing such.

Suits brought by the Welsbach Light Company against manufacturers of infringing lights and mantles are still pending and undetermined.

Every genuine Welsbach lamp has the trade-mark, "Welsbach," conspicuously printed on the package and on the burner itself.

Welsbach Commercial Company,

DREXEL BUILDING,

PHILADELPHIA.

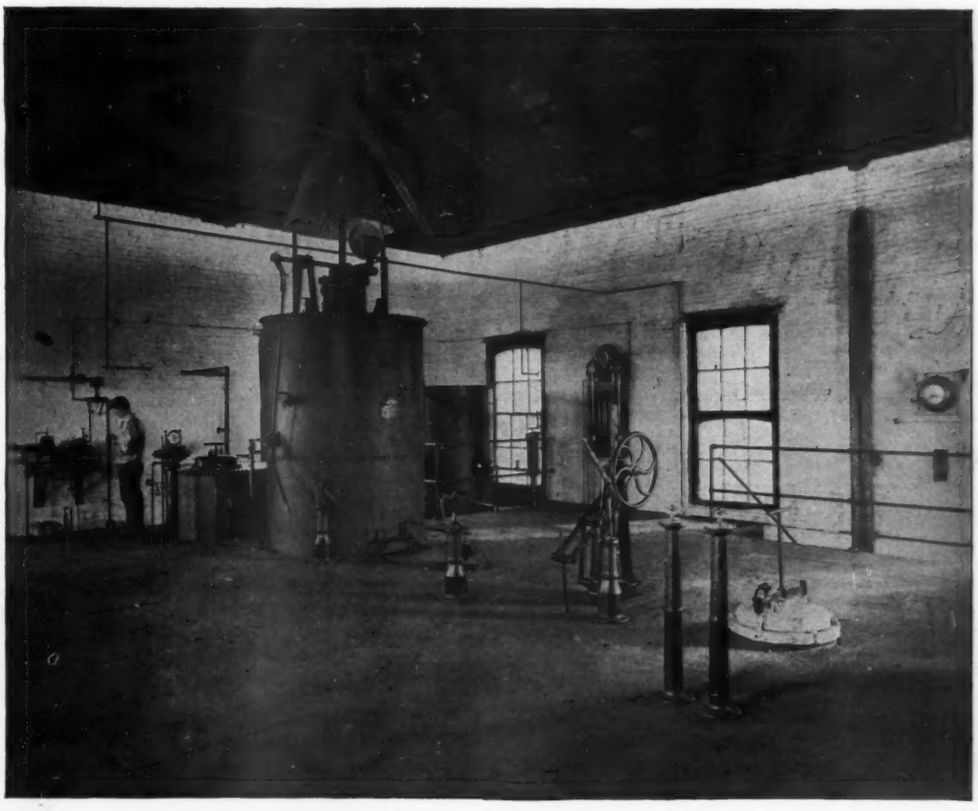
The United Gas Improvement Company,

DREXEL BUILDING, PHILA., PA.

The Standard Junior,

The Standard Double Superheater,

LOWE WATER GAS APPARATUS.



Total Built and under Construction,

289 Sets—Daily Capacity, 185,675,000 Cu. Ft.

ALEX. C. HUMPHREYS, M. E.,
BANK OF COMMERCE BUILDING,
(31 NASSAU STREET,)
NEW YORK.

CABLE ADDRESS,
LONDON & NEW YORK,
"HUMGLAS."

ARTHUR G. GLASGOW, M.E.,
9 VICTORIA ST.,
LONDON, S. W.,
ENGLAND.

HUMPHREYS & GLASGOW.

CONTRACTING AND CONSULTING

GAS ENGINEERS.

WATER GAS PLANT A SPECIALTY.
GAS PROPERTIES EXAMINED AND VALUED.
ADVICE AS TO IMPROVEMENT OF GAS PROPERTIES AND MANAGEMENT.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

NEW YORK, 33 NASSAU ST. PHILADELPHIA, 1932 MARKET ST. CHICAGO, 64 LAKE ST.

WELSBACH STREET LIGHTING COMPANY OF AMERICA,

—OWNS, CONTROLS AND OPERATES—
EXCLUSIVELY

THE NEW IMPROVED AND PATENTED

STREET LIGHT BURNER.

STYLE No. 81.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, enabling Gas Companies to furnish a uniform light in all localities.

Lists of Cities and Towns in which we are now lighting under contract will be furnished upon application.

STYLE No. 97.

CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.

National Gas and Water Company.

CONTRACTORS FOR
Gas Plant Machinery

SOFT COAL OR COKE
WATER GAS GENERATORS
A SPECIALTY.

218 LA SALLE ST.,
CHICAGO.

Gas Engineers
INSPECTION AND ADVICE.

PLANS AND ESTIMATES
FOR IMPROVEMENTS OR
REPAIRS.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)
MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR. OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT! WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION! REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE! IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.

Hughes' "Gas Works,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
WM. RICHARDS, C.E

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

A. M. CALLENDER & CO.,
32 Pine St., N. Y. City.

IRON MASS

For Gas Purification.
Acts immediately, and more efficiently than any other purifying agent now in use.

GREENPOINT CHEMICAL WORKS,
Greenpoint Ave. and Newtown Creek, Brooklyn, N. Y.

The Chemistry of Illuminating Gas.

By NORTON H. HUMPHRYS. Price, $2.40.
A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY.

ONEILL'S OXIDE,

(NATURAL BOG ORE)
For Gas Purification.

Has the Largest Annual Sale of Any Oxide in the World.

GAS PURIFICATION AND CHEMICAL CO., LTD.,
160, 161, 162 Palmerston Buildings,
Old Broad St., London, E. C., Eng.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREZEE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET-TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY

H. E. PARSON, Supt., 67 Bremen Street, Brooklyn, N. Y.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

SCIENTIFIC BOOKS.

NEWBIGGING'S HANDBOOK. By Thos. Newbigging. 6th edition. $6.

COX'S GAS FLOW COMPUTER. $2.50.

HUGHES' GAS WORKS. $1.65.

POOLE ON FUELS. By Herman Poole. $3.

GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor. $3.50.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.

CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.

PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

GAS WORKS: Their Arrangement, Construction, Plant and Machinery. $5.

PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

COAL, SPONTANEOUS COMBUSTION OF. By Thomas Rowan. $2.

COAL: Its History and Use. By Prof. Thorpe. $3.50.

THE GAS WORKS OF LONDON. By Colburn. 60 cents.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

GASFITTER'S GUIDE, by John Eldridge 40 cents.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2

CONSTRUCTION OF GAS WORKS, by Walter Ralph Herring. $2.

DIGEST OF GAS CASES. $5.

PRACTICAL HINTS ON REGENERATOR FURNACES By M. Graham. $1.25.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR. By Geo. Lunge. New edition. $12.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.

GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.

PRACTICAL PLUMBING. By P. J. Davies. $3.

AMERICAN PLUMBING. By Alfred Revill. $2.

CEMENT; A Manual of Lime and Cement, their Treatmen and Use in Construction. By A. H. Heath. $2.50.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Knapp. $3.50.

ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.

MAGNETISM AND ELECTRICITY. By J. Overend. 40 cts

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order No books sent C.O.D.

A. M. CALLENDER & CO., 32 Pine Street, New York.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point Baltimore, Md.
OFFICE, - 640 Equitable Building Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } *AGENTS,* { BANGS & HORTON, 60 Congress St., Boston.

W. D. ALTHOUSE & CO.

Reading Terminal—Philadelphia.

"Shaner," Westmoreland, Pa.

HIGH GRADE GAS COAL
AND
KENTUCKY CANNELS.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

GREENOUGH'S "DIGEST OF GAS CASES."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

— THE —

PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened and Prepared for Gas Purposes.

Their property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

Room 720, Reading Terminal Building, Phila., Pa.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River; Pier No. 1 (Lower Side), South Amboy, N. J.

EDMUND H. MCCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.,
WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE SUN OIL CO.

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

Toledo, O., and Pittsburgh, Pa.

Standard Oil Company,

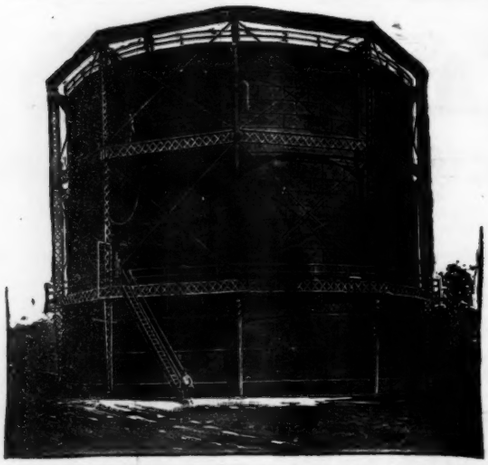
GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.



DAVIS & FARNUM MFG. CO.,

WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

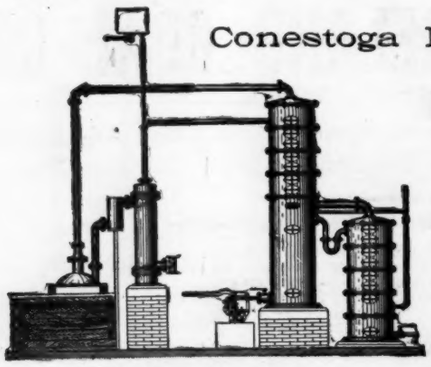
Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

GAS ENGINEERING COMPANY.

INCORPORATED,

Conestoga Building, PITTSBURGH, PA.



AMMONIA MACHINE.

MANUFACTURERS OF

Gas Works Machinery of all kinds,

PATENTEES AND OWNERS OF

PITTSBURGH WASHER-SCRUBBER,

SOLE AGENTS FOR

FELDMANN AMMONIA MACHINE,

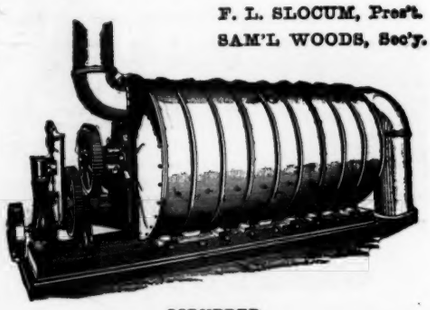
For producing Sulphate, Aqua, Chloride and Concentrated Liquors.

The Erection of Bi-Product Coke Ovens a Specialty.

Faux System of Recuperative Benches.

NEW SYSTEM HYDRAULICS.

F. L. SLOCUM, Pres't.
SAM'L WOODS, Sec'y.



SCRUBBER.

Kerr Murray Manufacturing Company,

Steel Gasholder Tanks,

SINGLE, DOUBLE AND TRIPLE-LIFT GASHOLDERS,

HORIZONTAL AND VERTICAL STORAGE OIL TANKS

Iron Work for Coal Gas Benches, Self-Sealing Mouthpieces, Exhausters, Condensers, Scrubbers, Purifiers, Wooden Trays, Floor Carriages, Center Seal and Valve System Connections, Cast and Wrought Iron Fittings, and Connections 3 to 36 Inches Diameter.

VALVES, Double Gate, Hub and Flange, Outside Screw and Quick Opening, 3 to 36 In. Diam.

COAL AND COKE WAGONS, RETORT HOUSE TOOLS, STREET MAIN SPECIALS AND DRIPS.

Address,

KERR MURRAY MANUFACTURING CO.

Fort Wayne, Indiana.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double and Single-Lift Gasholders.

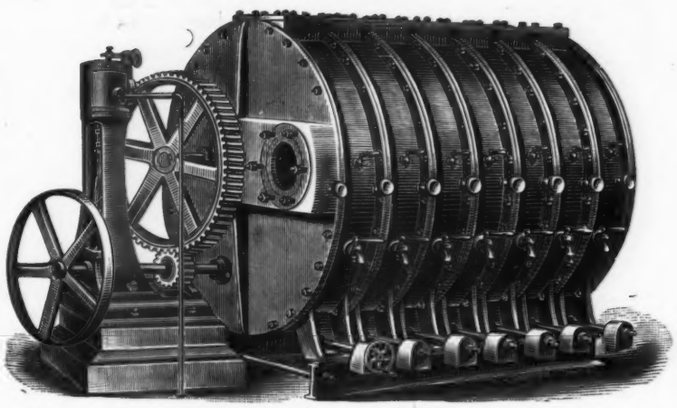
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS

Boilers.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSIBLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

NOW READY.

THE SIXTH (AND CENTENARY) EDITION

— OF THE —

Handbook for Gas Engineers and Managers.

By THOMAS NEWBIGGING, M. Inst. C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

PRICE, - - $6.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, N. Y. City.

Foundries and Works: { Millville, N. J. / Florence, " / Camden, "

R. D. WOOD & CO.

ENGINEERS, IRON FOUNDERS, MACHINISTS

400 Chestnut Street, PHILADELPHIA, PA.

MANUFACTURERS OF

CAST IRON PIPE

SOLE MAKERS OF

THE MITCHELL SCRUBBER

(PATENTED)

PURIFIERS, CONDENSERS, SCRUBBERS.

THE HOPPER AUTOMATIC GAS GOVERNOR.
BENCH WORK. PLATE GIRDERS.
IRON FLOORS AND ROOFS.

BUILDERS OF

GAS HOLDERS

Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks

PEASE'S PATENT WIRE ROPE GUIDING FOR GAS HOLDERS

CUTLER'S
PATENT FREEZING PREVENTER
FOR GAS HOLDER CUPS.

THE TAYLOR REVOLVING BOTTOM GAS PRODUCER,
HEAVY LOAM CASTINGS, DUNHAM SPECIALS, HYDRAULIC WORK
LAMP POSTS, VALVES, ETC.

ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

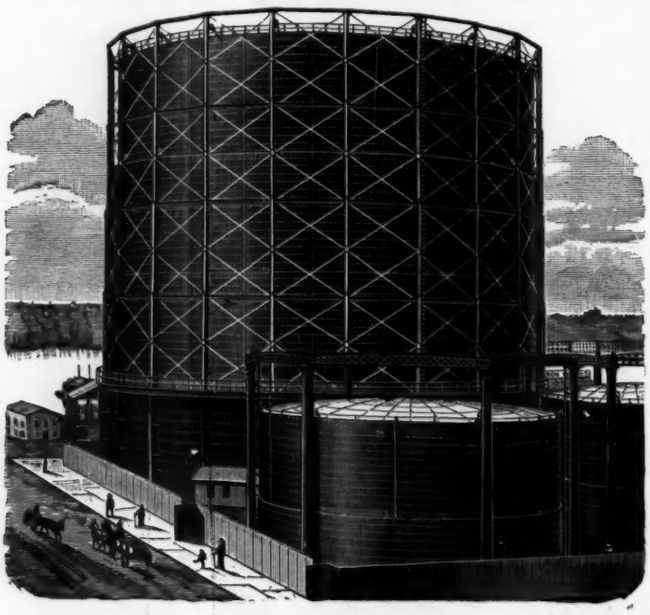
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. OFFICES Bridge & Ogden Sts., Newark, N. J.



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, JR., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

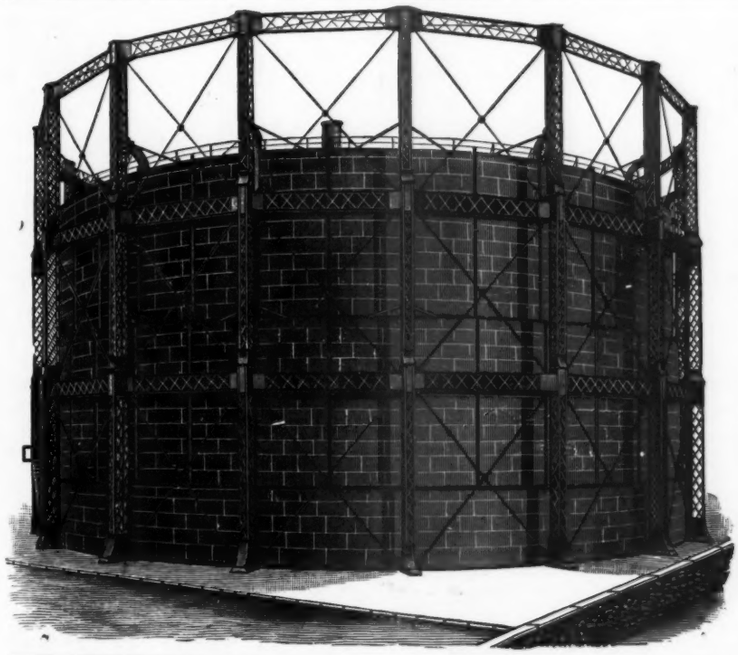
BURDETT LOOMIS, - - Hartford, Conn.

To Gas Companies.

We make to order CAP BURNERS to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. SEFRORER,
948 N. 8th St., Phila., Pa



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO

Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

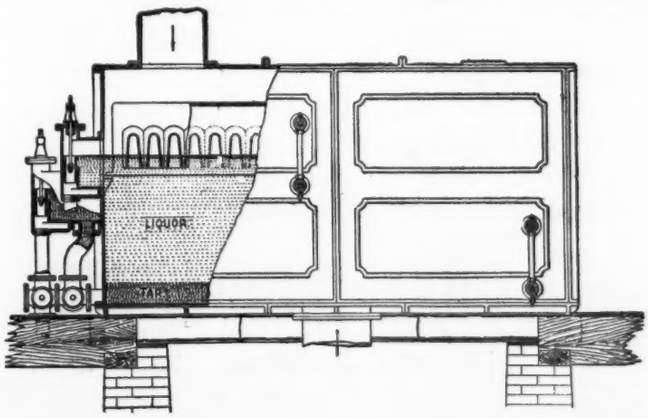
Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

Cincinnati, Ohio.



GEO. SHEPARD PAGE'S SONS,

SOLE AGENTS FOR THE

Walker Tar and Carbonic Acid Extractor.

During the Winter months over 12,000,000 feet of gas daily is being relieved of *all* Tar and a large percentage of Carbonic Acid by the Walker Extractor. They should be placed before all Scrubbers. The Tar and Liquor Overflow Valves work automatically. Write for Circulars.

69 Wall Street, - - New York City.

GEORGE R. ROWLAND.

Formerly with the Continental Iron Works.

Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

W. H. PEARSON, Prest. J. W. WESTCOTT, Gen'l Mangr. and Treas. L. L. MERRIFIELD, Chief Engr.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, Limited

269 Front Street, East, Toronto, Canada.

ENGINEERS AND BUILDERS OF THE **IMPROVED LOWE WATER GAS APPARATUS.**

Designed to give the Greatest Efficiency when using any kind of Oil, Anthracite Coal, Gas House or Oven Coke.

New Gas Works Built, Present Gas Plants, either Coal or Water, Remodeled

Catalogues, Plans and Estimates Furnished upon Application.

WM. HENRY WHITE,

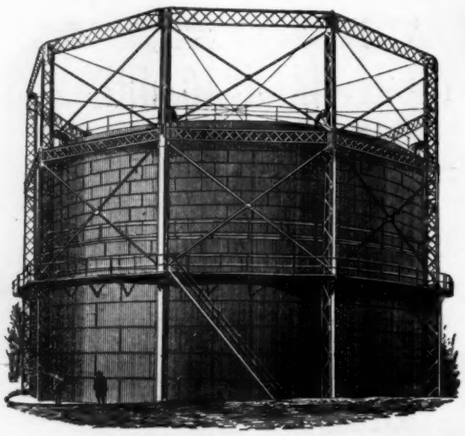
No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited
Plans and Estimates Furnished.



1842 * Deily & Fowler, * 1898

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS. WATER TANKS, AND GENERAL WROUGHT IRON WORK.

JAMES R. FLOYD'S SONS,

Successors to HERRING & FLOYD,

Oregon Iron Works,

West 20th and 21st Streets, Between 10th & 11th Avenues, New York City.

Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF ALL KINDS OF CASTINGS AND GENERAL IRONWORK FOR GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings, Condensers, Tower Scrubbers, Mechanical Scrubbers, Purifiers, Malleable Iron Retort Lids, Self-Sealing Retort Lids, Hydraulic Hoist Purifier Carriage, Crosses, Tees, Bends, Angles, Reducers, S-Bends, Sectional Sleeves, Plugs, Caps, Street Drips, etc., always on hand.

WOOD'S GAS SCRUBBING AND ENRICHING APPARATUS.

In use at Syracuse, Auburn, Watertown, Cortland and Geneva, N.Y.; Elizabeth, N. J.; Boston, Mass.; Jamaica Plain, Mass.; Providence, R. I.; Northern Liberties Gas Co., Phila.

Sole Manufacturers of the OGDEN QUICK-MOVING VALVE.

HEARNE CENTER SEAL, Operating One, Two, Three or Four Boxes.

Stroh & Osius Concentrator for Ammoniacal Liquor, used by 50 Gas Companies and Cokeries during the past 4 years.

The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu. Ft.

LOGAN IRON WORKS,

Brooklyn, N. Y.

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete with Steel Tanks.

BENCHES, SCRUBBERS,

CONDENSERS,

PURIFIERS, IRON ROOFS,

Self-Sealing Retort Lids,

AND ALL PARTS OF

GAS WORKS APPARATUS.

Contractors for Complete Works.

ALSO, SOLE MANUFACTURERS OF

C. W. BLODGET'S

HOT GAS SCRUBBER.

THE OHIO PIPE COMPANY,

MANUFACTURERS OF

Cast Iron Gas & Water Pipe,

BRANCH AND SPECIAL CASTINGS.

Gas-House Bench Castings, Hydraulics, Lamp Posts, Flange Pipe and Specials, Architectural Castings, Building Columns, Joists, Cellar Grates, Sash Weights, etc.

GENERAL FOUNDERS AND MACHINISTS

Columbus, Ohio.

DAVID LEAVITT HOUGH,

26 CORTLANDT ST., N.Y. CITY.

Consulting Engineer.

Investigations and Appraisals.
Designs and Estimates.

Contractor.

Machinery and Structures.
Gas and Water Pipe.

Special Agent for Selling & Purchasing.

Practical Hints

ON THE CONSTRUCTION AND WORKING OF

Regenerator Furnaces,

By MAURICE GRAHAM, C.E.

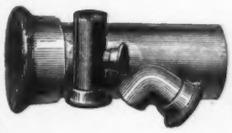
Price $1.25.

A. M. CALLENDER & CO., 32 Pine Street, N.Y.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches. Bends, Retorts, etc., etc

---

"GLOBE" SPECIALS VALVES, ETC. "GLAMORGAN" FIRE HYDRANT

M. J. DRUMMOND & CO.

MANUFACTURERS OF

CAST IRON

GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

Western Office: Monadnock Block, Chicago, Ills.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

CHARLES MILLAR & SON, Selling Agents, Utica, N. Y.

Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.

Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers' and Tinners' Goods.

CAST IRON PIPE and SPECIALS FOR WATER AND GAS.

Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

Established 1854.

D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

—ALSO MAKERS OF

THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

OVER 30,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

Correspondence Solicited.

511 West Twenty-first Street, NEW YORK. | **51, 53 & 55 Lancaster Street, ALBANY, N. Y.** | **34 & 36 West Monroe Street, CHICAGO.**

NATHANIEL TUFTS METER CO.,

8 Medford Street, Boston, Mass.

MANUFACTURERS OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Apparatus for the Chemical Testing of Gas and Gas Liquor.

Established 1849. With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 107 West Monroe St.**
NEW YORK, 1131 and 1133 Broadway. **SAN FRANCISCO, 221 Front St.**

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc , Etc.

"Perfect" Gas Stoves

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

THE DIFFERENCE BETWEEN GOOD METERS AND THOSE WHICH ARE "PRETTY GOOD" OFTEN MEANS THOUSANDS OF DOLLARS TO A SINGLE COMPANY.

MANUFACTURE PERFECT GAS METERS

THE KEYSTONE METER CO.

GUARANTEE THEIR WORK TO GIVE SATISFACTION.

Full Line of Sizes Kept Constantly for Sale on the Pacific Coast with
WIESTER & CO., Agents,
17 & 19 New Montgomery St., San Francisco, Cal.

OFFICE AND FACTORY, ROYERSFORD, PA.

American Meter Co.

NEW YORK, PHILADELPHIA,
SAN FRANCISCO.

Prepayment Meters.

Their construction is such that they may be readily readjusted when the scale of gas rates is changed.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

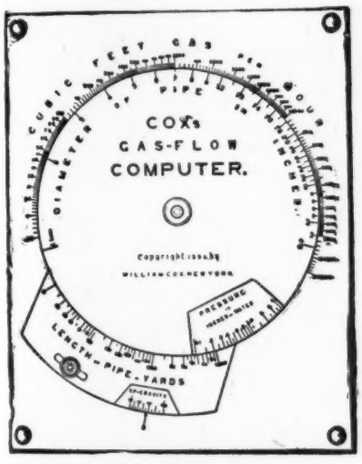
MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED



Do you wish to Know

what size of Pipe to use to convey any quantity of Gas, any distance, with any loss of pressure, and any initial or final pressure? Then use

COX'S GAS FLOW COMPUTER,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50.

For sale by

A. M. CALLENDER & CO., 32 Pine St., N. Y. City.

This is the best time to look after your repairing.

Seventy per cent. of old meters run slow. You are losing money on them. Let us put them in shape for you, a few at a time, until your entire meter equipment is made as good as new. It is better to attend to this matter now, before the Gas Stove season is at its height. Probably we can do such work in our factory better and cheaper than you can do it at home, and just now we can do it promptly.

The BUHL METERS are as good Meters as you can get.

DETROIT METER COMPANY, - - Detroit, Mich.

The advertisement of

JOHN J. GRIFFIN & CO., Mfrs. of Gas Meters, etc.,

Nos. 1513, 1515, 1517, 1519 & 1521 Race Street, Philadelphia,
52 Dey Street, New York, 75 N. Clinton Street, Chicago,

Occupies this page every alternate week

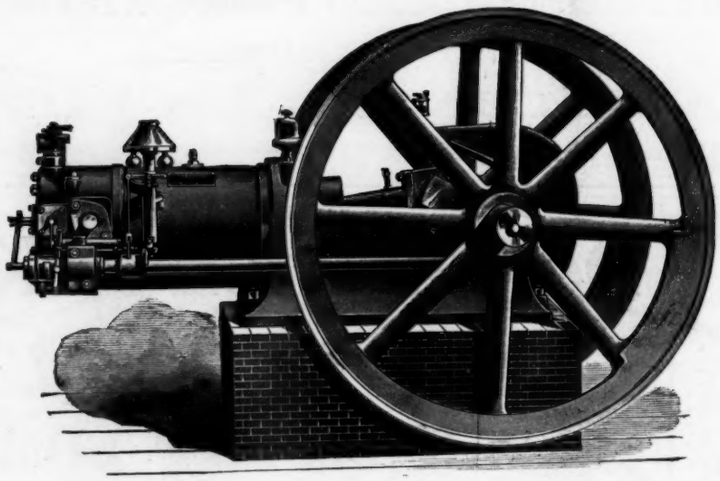
ARE GAS COMPANIES RECOMPENSED

FOR THEIR

EFFORTS IN FAVOR OF THE OTTO GAS ENGINE?

Those who Wish to Know will Find an Answer in the Following Figures.

Over 60,000 in Use.



The United Gas Improvement Company, by the lease of the Philadelphia Gas Works, derives a yearly revenue estimated at **$250,000 to $275,000** from the sale of gas consumed by OTTO GAS ENGINES exclusively in the city of Philadelphia, there being over 700 engines in use, ranging from 1 to 50 H.P.

The Gas Companies in Greater New York derive similarly a yearly income of **$300,000 to $330,000.**

A large number of small towns do, proportionately to their population, quite as well.

Have you ever actively given US any support in our efforts in YOUR behalf? If not, NOW is the time to take advantage of the present revival in business to place the OTTO before your Consumers.

The "OTTO" is Suited for All Power Purposes.

THE OTTO GAS ENGINE WORKS, Phila.

NEW YORK, 39 Cortland St. BOSTON, 19 Pearl St. CHICAGO, 360 Dearborn St.